THE BUILDER

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ARCHITECT & CONSTRUCTOR

VOL. CLVI JUNE 30 1939 No. 5030

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(Illustrated).

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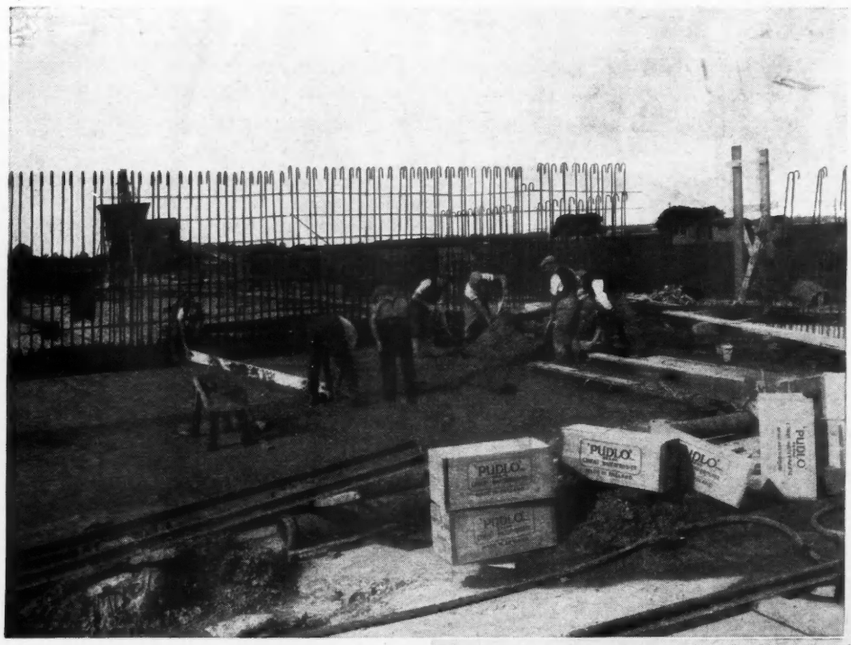

ABOVE: TANKS CONSTRUCTED 1937.

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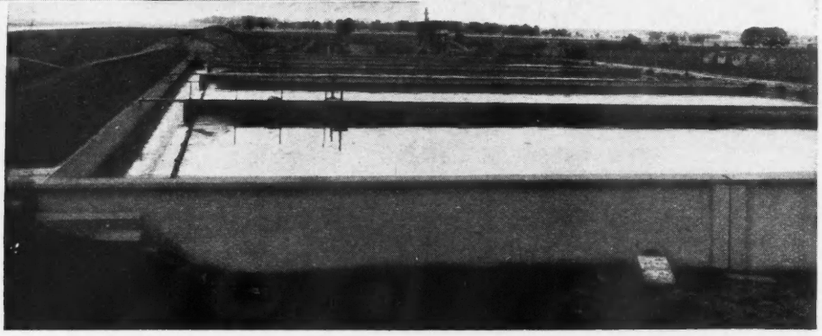

RIGHT: TANKS BUILT IN 1930 AND SIMILARLY WATERPROOFED.

THE test of seven years continuous use amply proved the soundness of the structural design and the method of waterproofing the sewage tanks built in 1930, seen in the lower photograph. The tanks, which are filled to a depth of 8 feet, are of reinforced concrete made impervious by the inclusion of 'PUDLO' Brand waterproofing powder, and it was a natural consequence of this satisfactory result that, in 1937, when it was necessary to double the capacity of these tanks, 'PUDLO' Brand waterproofer was again chosen. In the construction of these new tanks, 6 tons of 'PUDLO' Brand waterproofer have been used in 1,300 cubic yards of concrete, this being at the rate of 2 lb. of the waterproofer per 100 lb. of the Portland cement in a 4:2:1 mix.

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THE BUILDER

INCORPORATING

"ARCHITECTURE" AND "THE BRITISH ARCHITECT"

Vol. CLVI JUNE 30 1939 No. 5030

PRESTATYN HOLIDAY CAMP: THE MAIN ENTRANCE.

MR. WILLIAM H. HAMLYN, F.R.I.B.A., ARCHITECT.

COMING EVENTS

Friday, June 30.

Architects' Benevolent Society. Dance. 66, Portland-place, W.1. 9 p.m.

Town Planning Institute. Miss J. F. Adburgham, L.R.I.B.A., on "The Location and Design of Residential Estates." Caxton Hall, S.W.1. 6 p.m.

Monday, July 3.

Housing Centre. Fourth Annual General Meeting. 5 p.m. Guest Speaker: Sir Charles Bressey.

Monday-Saturday, July 3-8.

Royal Sanitary Institute. Health Congress. Scarborough.

Tuesday, July 4.

Housing Centre. Luncheon. Mrs. Darcy Braddell on "Commonsense in the Kitchen." 1 p.m.

The Society for the Protection of Ancient Buildings. 62nd Annual General Meeting. At Fishmongers' Hall, E.C.4. 3.30 p.m.

Institution of Electrical Engineers. Annual Conversazione. Natural History Museum, South Kensington, S.W.7.

Friday, July 7.

London Society. Informal Dinner and Midsummer Garden Party. Zoological Gardens, Regent's Park, N.W. 7.30 p.m.

Saturday-Saturday, July 8-15.

Housing and Town Planning. Seventeenth International Congress. Stockholm.

Monday-Saturday, July 10-15.

Leicester and County Chamber of Commerce and British Road Federation. Exhibition on Road Safety and the Need for Road Improvement. 50-52, Belvoir-street, Leicester. The exhibition will be officially opened by Lord Howe, who will also speak on "Road Conditions and Public Safety."

Society of Chemical Industry. Annual Conference. Exeter.

Thursday-Saturday, July 13-15.

Polytechnic School of Photography. Annual Exhibition of Students' Work in their School of Photography. Regent-street, W.1.

Friday-Saturday, July 21-29.

Architectural Association. Annual Exhibition of Work by Students. Opening Ceremony by the Rt. Hon. Lord Sempill on Friday, July 21, 8.30 p.m.

Monday-Friday, July 24-28.

Plumbing Instruction Course. For Technical Teachers. Hammersmith School of Building and Arts and Crafts, Lime-grove, Shepherd's Bush. W.12. 10 a.m.

Saturday-Sunday, August 19-September 10.

Association of Architects, Surveyors and Technical Assistants. Visit to Russia.

THE OBSERVATION TOWER. PRESTATYN HOLIDAY CAMP.

This Camp, opened last week, is one of the largest in the country, and is particularly interesting in view of the fact that, unlike many schemes of its kind, it has been designed by an architect, Mr. William H. Hamlyn, F.R.I.B.A., Architect to the London Midland and Scottish Railway. Further illustrations and a description of the Camp are given on pages 1219 to 1224.

TOPICS OF THE DAY

ADVISORY PANELS

IT is five years since the system of Advisory Panels, set up jointly by the R.I.B.A., the C.P.R.E., and the Institute of Builders, began its beneficent work, and, notwithstanding inevitable setbacks and disappointments, it may be said that the system has enjoyed a reasonable measure of success. Experience of the working of the panels has now accumulated in various parts of the country, and upon it the Public Relations Committee of the R.I.B.A. has based a Memorandum, which has been approved by the Council, for the guidance of architect-members of panels. Copies of this document (which is printed on page 1233) are being sent to the Allied Societies and the Central Panels Committee for circulation to panels controlled by these bodies.

The system has not functioned without a certain amount of friction; indeed, being concerned with matters of a highly controversial nature, it could hardly be expected to do so. If the panels are to do their work effectively, it is essential that they should cause as little irritation and opposition as possible, not only among local authorities, builders and building owners, but among architects themselves, whose works, it has to be sadly admitted, are not always above criticism.

The task of pointing out to a transgressor his offences against the canons of good design is a very delicate one, calling for the use of a good deal of tact and sympathetic consideration; and success is the more likely to be achieved if the approach is made with a conviction that offences are more often than not due to ignorance than to deliberate intent.

The Memorandum just issued has been very carefully drawn up, and may be said to constitute a code of conduct. It is a very human and useful document, and, if its wise suggestions are followed, should greatly facilitate the working of the panel system.

BACK TO ERIN

ON Saturday last there ended in Dublin one of the most successful and enjoyable of the long series of British Architects' Conferences. The foundations of this meeting were well and truly laid in 1931, when Dublin was first visited, by the enthusiasm and hospitality shown to their English confrères by the Royal Institute of the Architects of Ireland, who this year were joined as principals in that they were celebrating the completion of their first hundred years.

No one who was present at the Conference is likely to forget his experience or the expression of the common bonds of interest and mutual regard which unite the architects of Ireland with those of Great Britain—bonds which are not likely to be dropped by any political differences so long as both sides remain united in the service of the art and profession they serve.

The business sessions were commendably brief but very much to the point. Mr. Goodhart-Rendel's inaugural address made a deep impression in a country where fine oratory is valued highly, and his remarks on professional politics (reported in our last issue) were felt by many to strike at the root of this vexatious subject. That speech was followed by another at the banquet, equally brilliant in its humour and appositeness; the President's talents, in fact, have never shown to greater advantage and the Conference was for him a personal triumph which, we are certain, the Irish architects would be the last to grudge, the more especially as their reputation in oratory was magnificently upheld by Mr. Vincent Kelly, who made one of the wittiest after-dinner speeches which it has been our delight to hear. The banquet, indeed, and the dance on the Friday night, were in the traditional Irish spirit of hospitality and friendship—a further indication of which (much appreciated by the visitors) was the presence at the Garden Party of the Irish Premier, Mr. De Valera. The English visitors also were captivated by the city itself, in whose Georgian atmosphere seem to linger evidences of a civilisation almost pre-war in character and certainly far removed from the crazy rush for existence which England knows only too well. Of new architecture there is not a great deal (Dublin buildings, like old soldiers, never seem to die), but what there is has a scholarly flavour, and it is amply clear that if Ireland is not in the van of architectural progress, it has at least avoided some of the growing pains with which we in England have been afflicted in the past twenty years. Long may such a state of affairs continue.

No one who took part in the Conference will do other than feel that the long and honourable ties which bind the R.I.B.A. and the R.I.A.I. together have been immeasurably strengthened by this, the latest, meeting. Autonomy the R.I.A.I. has and has ever possessed, but its association with the R.I.B.A. has only strengthened it without robbing it in any way of independence. One hundred years of useful work has been done for the good of architecture in general and Irish architects in particular, and it has been a joy and privilege to the architects of Great Britain to have been able to join in the celebration of that work and to see the R.I.A.I. safely launched upon the next hundred years of amicable and useful work in as great a spirit of harmony, we shall all hope, as has been the century now completed.

BANKRUPTCY OF BUILDERS

THE large number of letters which we continue to receive on the above subject is testimony, if such were needed, to the concern with which this problem is regarded, not only by sub-contractors and suppliers of materials, but by architects, quantity surveyors and others. Many different aspects of the matter are discussed by our correspondents (of whose letters a selection is given on page 1218 and, as will be seen, many useful suggestions are made towards the elimination of a nuisance which has become a source of serious loss and inconvenience to the building industry.

Two or three suggestions stand out more prominently than others. One is that there should be better contact between architects and sub-contractors, so that the former may know when work has been completed, and the latter when certificates have been issued for payment to be made. No doubt many architects and business firms already follow this practice, but to judge from our correspondence it is far from being universally adopted.

The remarks of the Official Receiver on a voluntary liquidation, quoted by one of our correspondents, suggest that sub-contractors and suppliers have the remedy in their own hands, and to a large extent this may be so. None the less, a duty clearly devolves upon the building owner (if for no other reason than self-protection) to ascertain the financial status of a contractor before signing a contract, and we would suggest that no better clue could be offered than the unreasonably low tender. Better prices must inevitably mean fewer bankruptcies.

Sub-contractors and specialists, however, can obviously do much to help themselves by better trade protection and organisation, and we hope that the whole question may be taken up by the Building Industries National Council, representing as it does all the interests involved in the industry and its associated professions.

NOTES AND NEWS

The New Welwyn Store.

THE architect is often lost sight of at opening ceremonies, and it is therefore all the more pleasing to record the tribute of Lord Harmsworth to Mr. Louis de Soissons in opening the new departmental store at Welwyn this week. His lordship said: "I think that in the designing of this great establishment he [the architect] has almost excelled anything that his genius has hitherto provided us with." We have pleasure in endorsing these remarks. Welwyn Garden City, where Mr. de Soissons has done so much work, in its general lay-out and architectural treatment is one of the best of its kind, all buildings, from the smallest house to the largest, being skilfully and tastefully designed and carried out. The public buildings, including the Cherry Tree Inn, are particularly good. The architectural character is generally Georgian, and produces a most happy effect. The gardens are already maturing, and in a few years the Garden City will be a show place.

Art of Greater India: R.A. International Exhibition.

THE Royal Academy, in collaboration with a number of connoisseurs of Indian Art, is arranging to hold in January—March, 1940, an International Exhibition of the Art of the Indian Empire, French Indo-China, Netherlands India, Burma, Malaya, Siam, Afghanistan, Tibet and Nepal.

Their Majesties the King and Queen have graciously given their patronage to the exhibition. The co-operation of the French Government has been secured, and that of the Dutch Government is confidently expected, in the loan of works from museums in those two countries. The Executive Committee of the exhibition is under the chairmanship of Sir Edwin L. Lutyens, K.C.I.E., P.R.A., and has Sir John Marshall, C.I.E., and Sir Richard Winstedt, K.B.E., C.M.G., as vice-chairmen. The assistance of experts in the great museums containing Indian collections has been promised.

Port Glasgow Planning Scheme: New By-pass Road Around Burgh.

THE Department of Health for Scotland have approved a resolution by the Town Council of Port Glasgow for the planning of the whole Burgh under the 1932 Town and Country Planning (Scotland) Act. This will enable the Burgh not only to draw up a planning scheme to control the future development on the virgin fringe of their Burgh, but also to prepare schemes for the planning and reconstruction work which will have to take place from time to time in the heart of the older parts of the town. It will enable Port Glasgow Burgh to collaborate with the County of Renfrew, who are preparing a planning scheme for the adjoining County area, and also to fit in their planning proposals with the neighbouring Burgh of Greenock.

A projected new by-pass road designed to conduct traffic around Port Glasgow and Greenock will, so far as it may lie within the Burgh, form part of the Burgh's planning proposals.

Bradford City Architect: Recommendation for Position.

BRADFORD CORPORATION City Architect's Department Sub-Committee has recommended the appointment of Mr. Harold Conolly, A.R.I.B.A., acting City Architect, as City Architect, in succession to Mr. J. A. Fletcher, who retired recently.

Architectural Association Excursion to Switzerland.

THIS year's Architectural Association excursion will be to Switzerland for 13 days, from Saturday, July 22, until Thursday, August 3. The party will leave London for Folkestone and Boulogne at 4.30 p.m. on July 22, among the places to be visited being Basle, Zurich, Zug, Lucerne, Interlaken, Berne, Lausanne, Geneva and Paris. The cost, including rail, coach and steamer fares, hotel accommodation and breakfast, gratuities and meals on trains, will be about £22 10s. Members desirous of joining the party are requested to send in their names immediately to the Secretary, Mr. H. J. W. Alexander, the Architectural Association, 34, 35 and 36, Bedford-square, London, W.C.1.

The Roof of Bath Abbey: Fears for Safety.

THE condition of the beams in the roof of Bath Abbey is causing anxiety to the authorities. According to the Archdeacon and Rector of Bath, large portions of the beams have been consumed, and are now being consumed, by the death-watch beetle, and the result is that in many parts they are in a deplorable condition. If this is allowed to go on they will eventually crash through the fan-vaulting of the roof. The whole of the space between the fan-vaulting and the lead roofs is to be cleared from the accumulation of the dirt of many years in order that the actual damage may be seen more clearly. The work of restoration is to be carried out as quickly as possible, and the estimated cost is £4,000.

Architects' Benevolent Society Report.

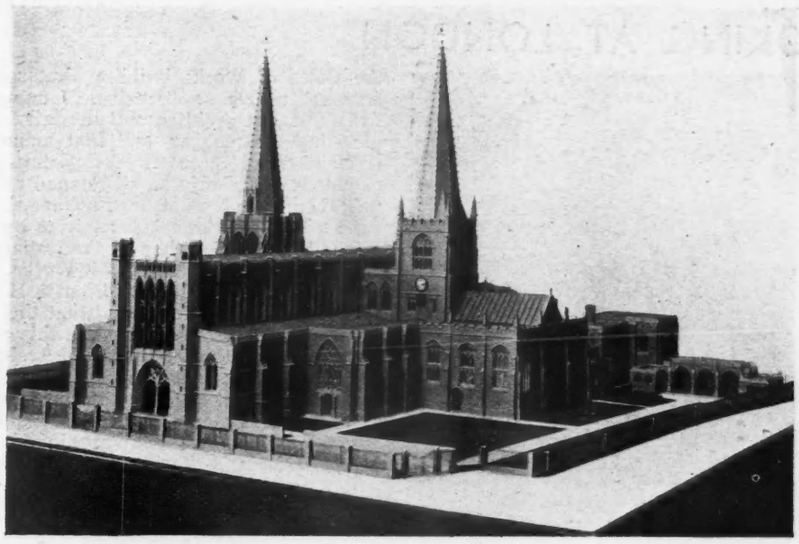
THE Report of the Council of the Architects' Benevolent Society for the year 1938 has just been published, together with a complete list of donors and annual subscribers and the by-laws of the Society. The Report states that the number of applications for assistance again showed an increase, the total number helped during 1938 being 124. Of the total, 47 were architects or architects' assistants, 67 widows and 10 orphans.

Town and Country Planning Summer School.

THE Town and Country Planning Summer School, which each year is attended by an increasing number of persons interested in town and country planning from a wide variety of angles, is to be held this year from September 1 to 8 at Bede College, Durham. An attractive lecture programme is being arranged, coupled with visits to the many features of planning interest within the area, in-

R.I.A.I. CENTENARY POSTER.

This poster was designed by Mr. Gerard P. Carey for the Centenary celebrations of the Royal Institute of the Architects of Ireland, held in Dublin last week. The design was also used as a decoration for the cover of the menu at the banquet held in conjunction with the R.I.B.A. Conference, at the Mansion House, Dublin, on June 22.



A MODEL OF SHEFFIELD CATHEDRAL.

This model shows the Cathedral, with extensions, viewed from the south-east; the architects for the extensions being Sir Charles A. Nicholson, Bt., M.A., F.R.I.B.A., and Mr. T. J. Rushton, F.R.I.B.A. (See this page.)

cluding the Team Valley Trading Estate. The fee for membership of the school is £1 11s. 6d. for the full week or £1 1s. for the week-end only. The charge for board and lodgings for the full period will be £3 4s. 6d., and for the week-end (Friday evening to Monday morning) £1 4s. 6d., gratuities 5 per cent. extra.

Those interested should communicate at once with the Honorary General Secretary (W. L. Waide), Council Offices, Hartley Wintney, Basingstoke, Hants.

Finnieston Bridge, Glasgow: Modified Scheme Approved.

GLASGOW CORPORATION have approved a modified scheme for a bridge across the Clyde at Finnieston. The design is of the "tied arch" type instead of the cantilever scheme previously proposed. The Minister of Transport is to be asked to nominate a consulting engineer, and the President of the Royal Incorporation of Architects in Scotland is to be asked to nominate an architect, to be associated with the Master of Works in co-operation with the Chief Engineer of the Clyde Navigation Trustees in the preparation of the scheme.

Chester Cathedral Refectory: A New Roof.

CHESTER Cathedral Refectory, one of the finest thirteenth-century monastic halls in the kingdom, is to have a new roof to replace the present plain roof. This is the gift of "an anonymous benefactor, whose generosity covers the cost and whose devotion to the art and architecture of Chester and her Cathedral has made possible the glorious completion of this beautiful monastic building." The craftsmen for the task are all resident in Cheshire. Mr. F. H. Crossley, A.R.I.B.A., is the Cathedral architect.

Sheffield Cathedral: Progress of Work on Extensions.

THE model of Sheffield Cathedral illustrated on this page shows the scheme as completed to the architects' design. The new nave and choir stand north and south and cover the ground at present occupied by the nave of the parish church, the old steeple and chancel being retained without alteration, and the old transepts being lengthened to form an additional aisle to the nave and choir. The two views of the model show the grouping from the north-west and south-east respectively. The new steeple is approximately in the position of the west front of the old nave. The eastern part of the new work is now in use, and the greater part of the foundations for the new nave and choir has been completed. The architects for the scheme are Sir Charles A. Nicholson, Bt., M.A., F.R.I.B.A., and Mr. T. J. Rushton, F.R.I.B.A., and the excellent model illustrated is the work of Messrs. Partridge's Models, Ltd.

The Late Mr. J. B. Thorp.

IT is with regret that we record the death, at the age of 77, at his home at Bedford Park, W., of Mr. John Brown Thorp, the well-known authority on old London and model-maker.

In his workshops in Gray's Inn-road, Mr. Thorp spent thousands of hours on a model of medieval London; some of the models were of historic thoroughfares, 25 ft. in length and constructed with great accuracy of detail. In 1931 many of Mr. Thorp's models were shown in the City to raise money to repair the tower of St. Magnus the Martyr. Some of his models are in the London Museum.

Mr. Thorp recently collaborated with Sir Edward Lutyens and Sir Charles Bressey in their plan for improving Tower Hill. He made the model which was shown, using as his authority another model of Tower Hill in 1600.

The business will be carried on by his son, Mr. J. L. Thorp.

War Office Announcement.

THE War Office announces that Mr. H. C. Cole, C.B.E., F.S.I., Chief Land Agent and Valuer at the War Office, has been appointed Comptroller of Lands in succession to Mr. B. R. T. Grindle, C.B.E., who has retired from the public service.

Professional Announcement.

MR. DONALD HEWITT, F.S.I., has recently changed his address from 42, Deansgate, Manchester, 3, to 8, Exchange-street, Manchester, 2. Telephone, Blackfriars 0106.

COMPETITION NEWS

Primary School, Edinburgh: The Award.

The assessor, Mr. James D. Cairns, F.R.I.B.A., in the competition for a primary school to be erected on a site fronting Glenogle-road, Edinburgh, has made his award as follows:—

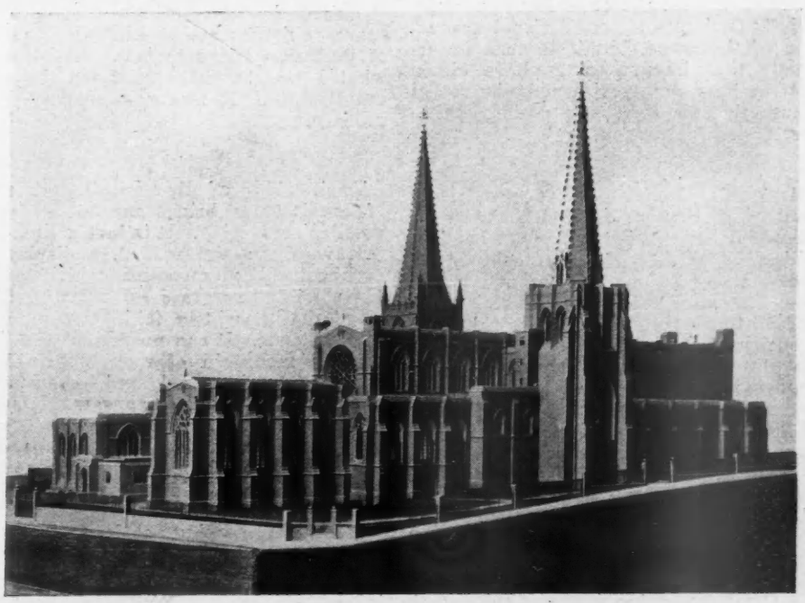
1st (100 gns.): Messrs. Carr and Howard, A.R.I.B.A., Edinburgh.

2nd (50 gns.): Messrs. Reid and Forbes, FF.R.I.A.S., Edinburgh.

The competition was limited to architects resident or practising in Edinburgh.

CURRENT COMPETITION.

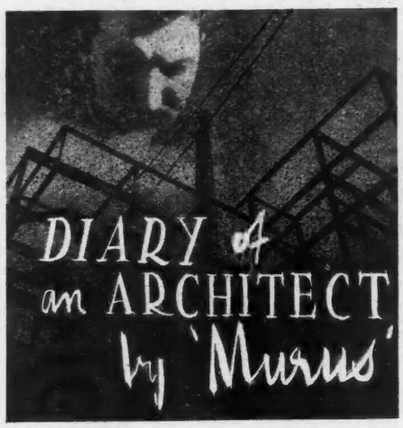
Proposed Supreme Court, Lagos, for Government of Nigeria. Mr. A. F. B. Anderson, F.R.I.B.A. S.A.D.G., assessor. Premiums: £500, £300, £200. Conditions, site plans (dep. £1 1s.) from The Crown Agents for the Colonies, 4, Millbank, London, S.W.1. Questions by Feb. 14	Particulars published in "Builder." Dec. 23	Sending in date. June 30



A MODEL OF SHEFFIELD CATHEDRAL.

The Cathedral with extensions, viewed from the north-west. (See this page.)

LOOKING AT LONDON



June 12.—This is pure inspiration—or maybe it is the result of being confronted with a particularly lovely summer evening and no appointments. London in summer is one of those nauseating ideas which conjure up a vision of hot streets—fussy with traffic and peopled by dark-suited gentlemen wearing bowler hats and a harassed look.

* * *

That is the London that I, in common with almost every other person, dislike; and my inspiration is concerned not with that but with the London that is quiet and (forgive the poetic touch) bathed in evening sunlight. Part of my inspiration is concerned with looking at this London and, instead of glancing *en passant*, stopping the car, taking out paper and pen, and writing about it.

* * *

I would prefer to take out a dictaphone for such a trip. You may not know much about dictaphones, but as machines which can be used for interpreting one's thoughts in as fluid a way as possible, there is a great deal to commend them. It demands one thing—and that is, that you be used to dictating; but, given that ability (which is best come by after writing a great deal and then talking instead of writing), this is the ideal way and the ideal place for presenting the pictures of what I see—namely, the panorama of buildings laid out before me as I sit in a car parked diagonally across the Horse Guards Parade.

* * *

I chose this particular pitch because it is so typical of London—the synthesis of all that goes into the tourist's and provincial's idea of something different from that to which they are accustomed. In front and beyond lies St. James's Park, which is so elegant in its setting as to create the impression of being used by elegant people. I can see them as they come out of the park and across the parade—for the most part in pairs.

These people are, I repeat, not elegant; yet the character of their environment gives them a dignity they do not possess. This is fortunate for one's visual impression of the scene, but it is most unfortunate that human beings have either lost, or have not yet learned, the art of being graceful—as yet are unable even to dress with distinction.

* * *

And this elegant park, conceived by Nash and Repton, is a depository for memorials of various kinds. London, without doubt, has been unlucky in its choice of public monuments; and I suppose that applies to all provincial towns and all towns throughout the world. It is a curious fact that a committee will ruin anything pertaining to the creative arts—though in point of fact it is not curious, because every person sees reality in a different light, and a committee of persons (if they wield influence) is bound to destroy the individuality of the artist.

SIR EDWIN LUTYENS showed a rare ability to cope with monument committees in his achievements of the Cenotaph and the George V Memorial at Windsor, but the finest monument of them all is the Charles I equestrian statue at the Trafalgar-square end of Whitehall, with an exquisite base by Wren. That I regard as the finest statue in Europe (including even the Cellini monument in Venice). A much lesser design, though one in good taste, is the Foch Memorial in Grosvenor-gardens. A statue which was spoiled by a committee, and which might have been good, was HARDIMAN'S statue of Haig, which was done in collaboration with ROWLAND PIERCE.

* * *

The scene that I am describing is, in general, anathema to the free thinkers of architecture—those that put forward philosophy and put behind academic thinking—for there is no building in sight which is not of the Renaissance. There are columns, pediments and balustrades on the large pile which houses H.M. Office of Works. I remember how, when I was a student of architecture, we were taught the scholarship which lay behind the existence of a solid foundation of rusticated stone, giving the impression of strength—the masculine qualities necessary on the ground floor; the importance of the "Piano Nobile" on the floor above; the subsequent decrease of window area as the building increased in height. Well, it all exists, supplemented by the bare and strong base, the columns on the "Piano Nobile"; the pilasters on the floor above; the alternating circular and triangular pediments on the main floor; panels, spandrils, balusters, plaques, sculptures, carved chimney stacks—the whole range of Palladian tricks in fact. And this is what I was taught constituted the real architecture. It means a great deal to unlearn.

* * *

To sit cold-bloodedly analysing this kind of architecture brings me to the only possible conclusion. It is first, a dreadful extravagance; and second, a display of architectural mannerisms which could not possibly exist in a community which ruled out those two failings—pomposity and pretence. It can no longer exist, but what a mountain of architecture there remains to be used and, eventually, demolished before it disappears. Near by is the back of Downing-street, which is infinitely more modest—as strict a use of building materials and technique as one is likely to find in the contemporary idiom. That it can no longer exist is equally obvious; but, at least, it serves its purpose as being a good museum piece.

* * *

And then there is the Horse Guards building, by Kent, which is as Italian as the Office of Works building, but somehow not nearly so offensive. I suppose the quality of architectural integrity has gone into its making, and that makes a tremendous difference. Comparing the two, it is not nearly so abandoned as its neighbour; and what forms have been used bear a stricter relationship to building and its function than do the Italianate trimmings of the Office of Works. I remember being told that Kent's Horse Guards is small in scale, and that therein lay a great fault. I cannot see this as a fault, though the smallness of scale is apparent. It is well-knit as a structure, the sense of texture and material is very right; what is more, there is a delightful play of architectural counterpoint in the placing, size and shapes of the voids.

If you look closely at the fenestration, its virtuosity in design is not unlike a highly-developed piece of symphony music. The building, in short, not only has a strongly marked sense of form, but the means of achieving the whole are strictly economical (and this is only possible of realisation by studying the Office of Works and the Admiralty building on either side). Further, the taste is exquisite, and, as Renaissance architecture (even if you dislike it) it is a gem.

* * *

And then, on the flank of the parade ground (facing H.M. Office of Works) is the Admiralty. At least, I suppose it is the Admiralty because its pretentious domes are surmounted by an elaborate aerial which suggests ships at sea and the Morse Code, all resolving themselves into good order before disappearing into the Whitehall pigeon-holes.

The columns supporting the pavilions are not only Ionic-Composite, but fluted for three parts of their lengths. Each window architrave is possessed of a small half-pilaster, broken in its length by four projecting stones. Scrolls and lions lead up to the skyline—reliefs occur in the semi-circular pediments of the centre windows.

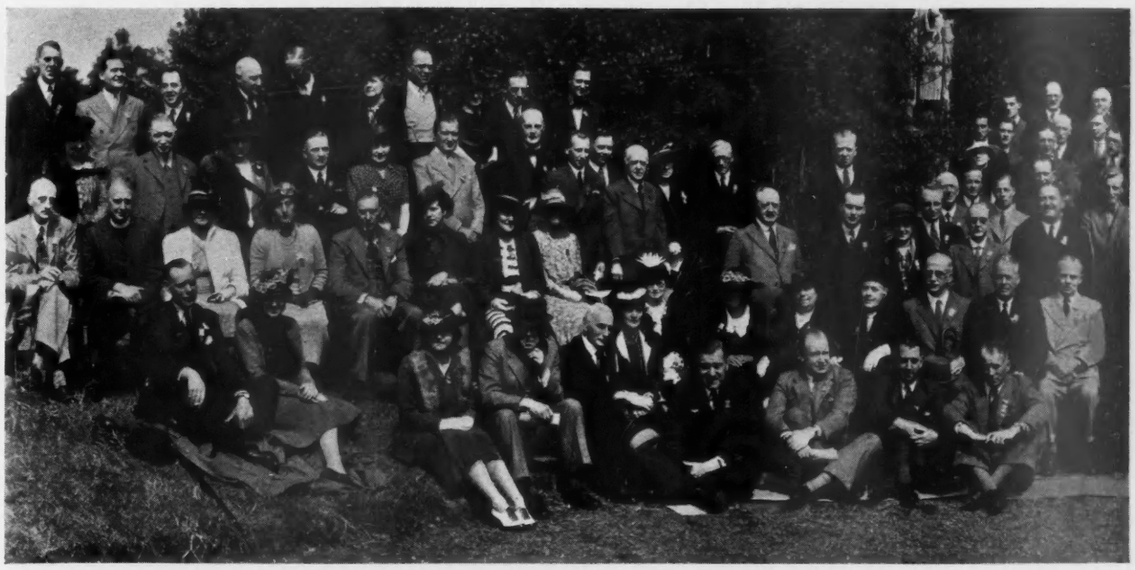
I tell you, it is a rare architectural banquet.

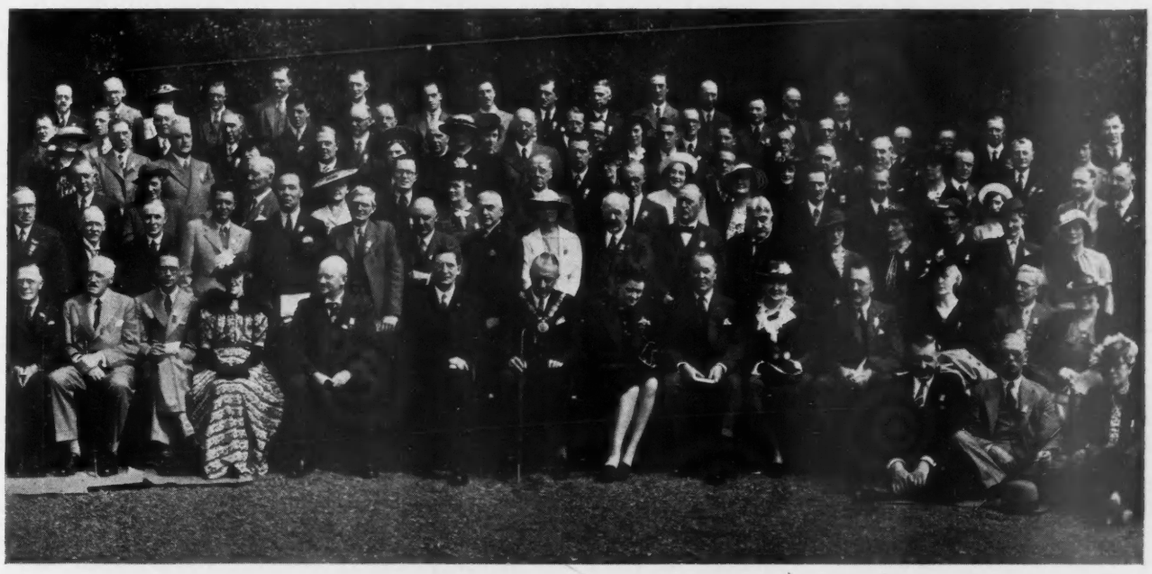
* * *

And yet this is the part of London which all the world comes to admire—and its pomposity is the only thing that could possibly strike awe into the spectators. That and the severe discipline of the Trooping of the Colour. St. James's Park is good, Downing-street is harmless, the Horse Guards building is an exquisite museum set, and Nash's Carlton House-terrace has style, even though one would find in extremely difficult to live inside the buildings.

Writing this suggests to me that one is not likely to know one's own surroundings until one sits down and either draws them or writes about them. I commend the practice as being good for one's sense of observation, a help to the technique of setting down what one sees in the form of a word picture, and, finally, a useful purge to one's feelings on building, which tend to be impressed by large buildings without stopping to inquire whether or not their interiors function with the degree of efficiency that they might.

Mnemus





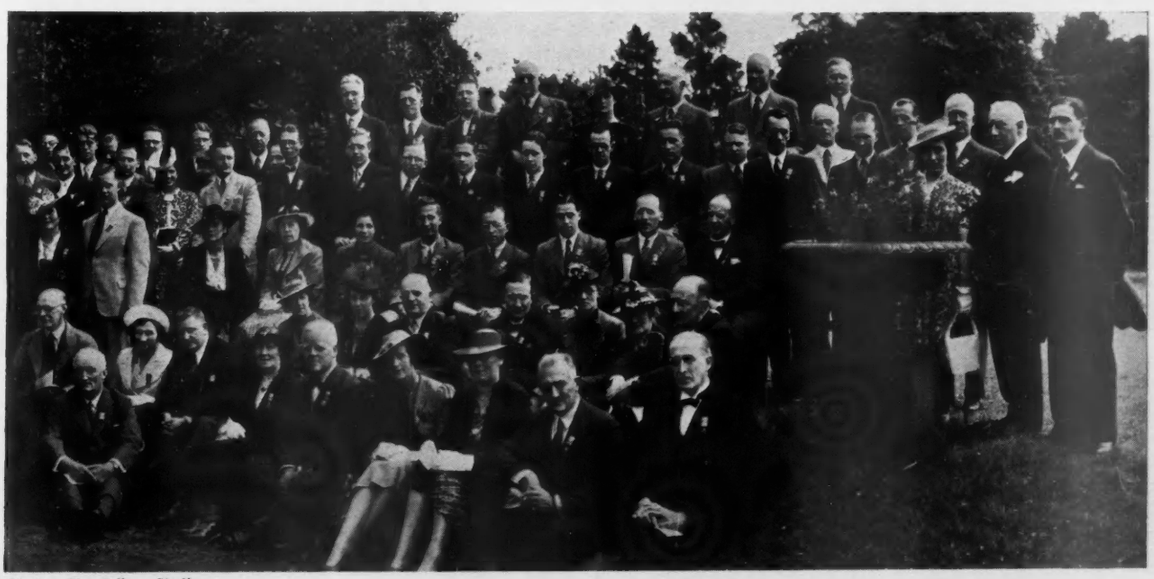


Photo: The College Studios.

GROUP PHOTOGRAPH TAKEN AT THE ARCHITECTS' CONFERENCE, DUBLIN.

(SEE REPORT IN THIS ISSUE).

THE DUBLIN CONFERENCE

A MEMORABLE MEETING

THE centenary celebrations of the Royal Institute of the Architects of Ireland, held jointly with the annual British Architects' Conference, concluded on Saturday last after a memorable meeting, in which nearly 300 architects and others took part, including an exceptionally large number of British architects. The R.I.A.I. admirably fulfilled that initial duty of good hosts, the securing of good weather, and this greatly added to the enjoyment of the visitors, especially as it enabled them to see the Irish countryside at its best.

Those who were able to get to Dublin by Wednesday evening were guests of the R.I.A.I. at a reception at the Mansion House, where they were received by the president, Mr. J. J. Robinson, and by Dublin's remarkable Lord Mayor, Alderman Alfred Byrne, whose period of service has extended since the 1931 conference, and whose warmth and sincerity of welcome made him a popular figure among the members. Afterwards the English visitors had a foretaste of their Irish hosts' private hospitality—a mixture of good fellowship and conviviality, to which was added the slightest dash only of sleep.

The main business session was held in the Mansion House on Thursday morning, when Mr. Goodhart-Rendel delivered his valedictory address to architects—perhaps the most brilliant "swan-song" that we remember. This, and the Irish president's most interesting account of the foundation and early history of the R.I.A.I., were excellently received by a full house, whose thanks were expressed by Mr. Harry Allberry and Mr. Ralph Byrne. These papers were reported in our last issue.

Lunch over, members and their friends attended the garden party at Lord Iveagh's garden in St. Stephen's Green, where the conference photograph was taken and a pleasant afternoon spent with music and dancing. The party was honoured by the presence of Mr. De Valera.

In the evening, the conference banquet was held in the rotunda of the Mansion House, where magnificent hospitality was dispensed, followed by some good speeches and delightful singing. A report will be found elsewhere in this issue.

A wide choice lay open for Friday. Many listened to Mr. C. H. Aslin's thoughtful and rational paper on "The Work, Duties and Responsibilities of the Official Architect," while others seized the opportunity of seeing something of the loveliness of the countryside around. Others, again, visited Dublin's buildings or accepted the kind invitation of the Italian Ambassador to an afternoon party at his charming home at Luttrellstown.

For ourselves, the visit to the Liffey Hydro-electric Scheme at Poulaphouca proved a strong inducement, and a party under the guidance of Mr. Manning Robertson, which included Mr. C. G. Soutar, Professor Patrick Abercrombie, Mr. McWilliams (representing the Institute of South African Architects), Mr. W. J. Benslyn, and Mr. Hastwell Grayson, set off at "screich o' day" from Merrion-square *en route* for Palmerstown House by way of Phœnix Park (where the gardens and the Wellington Memorial were admired), and Chapelizod (reputed home of Iseult). At Palmerstown the party were received with great kindness by Mr. and Mrs. W. J. Kelly and their daughters, who showed them their magnificent and charmingly maintained racing stables and gardens before offering them abundant hospitality in their house, which was built for the late Earl of Mayo in 1922. Lunch was taken at Naas, after which Russborough House was visited, through the kindness of Captain Daly, its owner. Here Mr. Curran joined the party, and gave a historical account of the exquisite plaster ceilings, which are a feature of this house, built in 1741 to the designs of Richard Castle and David Binder. The house and its furnishings were much admired.

The party then left for Poulaphouca to inspect the constructional progress on the combined hydro-electric and water supply scheme to provide additional energy to the national electrical systems and to augment Dublin's supply of water. The 200-ft. dam across a narrow gorge will form a lake of about 5,500 acres, and a 16-ft. diameter tunnel will supply a 154-ft. head of water to two turbines, which have a combined capacity of 30,000 kw.

Tea was taken here, and the party then left for Dublin, where it broke up with a warm expression of thanks to their guide and to Mrs. Manning Robertson for an interesting day.

We learnt afterwards that the other tours had been equally successful, for which praise is due not only to their guides (Professor R. M. Butler, Messrs. Harry Allberry, J. H. Webb, R. C. Keefe, T. G. Hicks, H. G. Leask, and H. V. Millar), but to the Organising Committee and especially Mr. T. F. Inglis, M.R.I.A.I., whose arrangements were so well made.

The conference proper came to a close in the small hours of Saturday morning, following a ball at Lord Iveagh's lovely house in St. Stephen's Green, a memorable evening which terminated a conference that will long remain in the thoughts of those who had the privilege of attending "Dublin, 1939."

Finally, no praise can be too high for the efforts of the R.I.A.I. Organising Committee and staff, and for the work of the R.I.B.A. officials, which made all arrangements run like clockwork, and so materially assisted in the success of the conference.

THE WORK, DUTIES AND RESPONSIBILITIES OF THE OFFICIAL ARCHITECT.

MR. C. H. ASLIN, F.R.I.B.A., Borough Architect, Derby, in the course of his paper on "The Work, Duties and Responsibilities of the Official Architect, said: We are apt to think of the official architect as something quite new in the profession, and the private practitioner as the normal and established unit, but this is by no means so. Through the long line of architects, known and unknown, since the days of Egypt and Greece, through the Roman Empire, the Mediæval Period and the Renaissance, architects have obviously been remunerated for their labours in a variety of ways; in some cases by wealthy patrons, in others employed by the State or Church, and their work has been judged by their contemporaries and by posterity on its merits and as works of art, without any regard for the way in which they were paid for doing it.

It is interesting to note that there was a surveyor or comptroller of the King's Works as early as Edward I, and the first official architect in this country who carried out works on a large scale was no less a person than Inigo Jones, who was surveyor to the King from 1615 to 1648. From 1705 to 1718 the office of the surveyor was occupied by Sir Christopher Wren, and amongst the names of other distinguished architects who held office under the Crown are those of Hawksmoor, Colin Campbell, William Kent, Robert Adam, Sir William Chambers, Sir James Pennethorne and Sir Robert Smirke. Whatever the individual capabilities of the modern official architect may be, he can at least claim the inspiration of following a company of very distinguished members of the profession.

The Official Architect To-day.

The official architect has of recent years been looked upon as something new, and perhaps strange, merely because he is in his present form a product of the age in which we live. In the last century, marked by individualism in trade and other enterprise, he would have been an anachronism. To-day, in a world of Government control and social services, of municipal enterprise and great combines, the official architect has grown naturally into this new shape of controlled undertakings so different from the individualistic world of the nineteenth century.

Though, as I have said, the idea is not new, it seems necessary to define the official architect, because in the past few years since we became conscious of him he has appeared to be, in some quarters, a person with a completely differing outlook, and in a category apart from his brother practitioners. This seems to me an entirely erroneous conception, because in the actual purpose of his work, his ultimate aim and ideals, he in no sense differs either from the present-day practitioner or the long line of architects of the past. His professional training is precisely the same as any other member of the profession, and until he becomes qualified he is probably completely unaware of the inclinations and opportunities which will shape his career. When he becomes the servant of a local authority or Government department, his attitude to the great art of which he is a practitioner, and his attachment to the profession, differ in nothing from that of the private practitioner.

If he does not differ in his training and his general outlook, in what then does his work differ from that of others? I suggest that there can be only two possible differences. The first and obvious one is his method of payment, which is by way of salary instead of being remunerated by a commission on the cost of work which he carries out, and the second is that his method of employment may cause him to develop an outlook which ultimately affects the buildings he designs.

The official architect receives a salary for which he is expected by his employers to carry out a continuity of work of considerable variety and apparently ever-increasing volume. On the other hand, a private practitioner must build up a practice and depend for his livelihood on a variety of work from individual clients, for which he receives payment by way of a percentage on the cost. In the one case the work is forthcoming without effort on the part of the architect, and, in the other, considerable enterprise and business ability are needed to obtain it.

There is in some minds an idea that all virility lies in competition, and that work executed under its stress is necessarily superior to that carried out in the alleged shelter of an official office. On the contrary, I suggest that a mind freed from the necessity of expending energy on competition has all its energies left to concentrate on the work for which it was trained, whereas a large part of the private practitioner's time, unless he be among the few whose reputations are such as to attract a continuity of works, is taken up with securing commissions, and therefore less time is employed in executing them.

The way in which Government control has placed the burden of housing, education and the medical services in increasing quantity on the local authorities has undoubtedly stimulated the increase in numbers and quality of official architects.

To local authorities familiar with the idea of employing such permanent officials as the town clerk, medical officer, and surveyor, who have been statutory officers from the beginning of local government as we now know it, it was an obvious step to enlarge the scope of

their activities by the direct employment of architects.

It also became apparent that to have an architect permanently employed was an asset, in that he could be consulted on all forms of town planning and tentative schemes of development upon which an authority would hesitate to employ a private architect, with the result that without the official architect many schemes worth close consideration would never be considered at all.

Maintenance of Buildings.

Another point which is doubtless a considerable advantage to local authorities is that the official architect is constantly liable for the maintenance of the buildings which he has designed. His duties do not terminate at the expiration of the maintenance period, and he is therefore more particularly interested in the cost of maintenance than if his work terminated with the handing over of the completed building to the owners.

A further reason which prompted local authorities to adopt the possibility of direct employment was the question of cost, as it is undoubtedly much more economical to run a successful office than to employ individual architects for each scheme. I do not believe this latter to be of great importance, because the average local authority is interested not only in economy but in discovering the best way to carry out its many services, and when an authority discovers that it is not paying sufficient to demand the services it requires, my experience is that it will not hesitate to pay more.

The profession of architecture on behalf of a corporate body has obviously many problems and difficulties. The first and most obvious, at least to the profession, is the practice—which I regret to say is prevalent in many quarters—of entrusting architectural problems to the care of a surveyor or engineer, who in turn employs architects to carry out work in his name. This method has no doubt been adopted on account of the reluctance to start up a new office through fear of additional costs, aided by the tenacity of some local government officials who are able to persuade their councils of their capability of carrying out work for which they have no training.

It is also clear that one of the difficulties of the system lies in the increasing quantity and variety of works carried out by official architects. It is possible, of course, for a man supplied with work from an endless source to become dull and unenterprising, to take the easy course, to design a school like the one he did a few years ago, or a hospital based on some stock pattern. Some people have an individual virility which can successfully overcome this condition of things, but I suggest that the soundest way to keep an office alive and vital is by the help of new and vigorous young blood in the way of assistants. The correct way, in my opinion, is to give each assistant a considerable amount of freedom, the control of his job, and to acknowledge the work he does in an open and proper manner. If this is done, the office will remain alive, its ideas will keep up with the times, its vigour will be unimpaired, and its personnel will continue to keep that frame of mind which is conducive to good work.

It is difficult to say what volume of work is carried out by official architects, but in the provinces it certainly exceeds that executed by private practitioners, and it is not an exaggeration to say that in some towns not less than 75 per cent. of the important works are carried out by the local authority. This means, of course, that the official architect is leaving his mark very strongly on local work, and his responsibility to the community is correspondingly very high.

The architect includes on his staff engineering assistants dealing with mechanical, electrical, heating and structural matters. This, on the face of it, appears to be a reversal of the condition mentioned earlier, when objection was registered to the employment of architects by engineers, but I submit that this is the natural outcome of the accepted system, and varies in no way from the accepted practice of employing consultants for fees on works controlled by the architect.

"Raison d'etre" of the Official Architect.

It will be realised, however, that there is an essential difference between the employment by the architect of engineers, and the reverse case. The architect is the designer and creator of the building, and it is proper that he should have the assistance of experts in matters of detail, and the principle is not affected whether these experts are engaged directly and permanently, or by way of fees on individual works. On the other hand, the engineer or surveyor is not a designer of buildings, and it is, therefore, not reasonable that he should employ architects to carry out work for which he takes the credit.

The employment of quantity surveyors is another factor which varies in different offices. I understand that most official architects number quantity surveyors on their staff. Some of the larger ones continue to put out their work to quantity surveyors in private practice.

With regard to the cost of running the office, this, contrary to public conception, is a matter in which the local authority takes considerable interest, and by cost I mean the whole cost. It is usual to believe that cost means salaries and little more, but in compiling the cost of carrying out works, salaries, rent, rates, lighting, heating, transport, equipment and minor expenses are all included, and any suggested addition when the annual estimates are presented is always met with minute scrutiny and frequently strong opposition.

There appears to be some division of opinion concerning the treatment of sub-contractors. Some of my colleagues appear to think that the R.I.B.A. Form of Contract is designed to make a present to the general contractor of 2½ per cent. on the value of all work carried out by sub-contractors, and that it is much more business-like and equitable to attempt to save these discounts by letting all the sub-contracts as separate contracts and placing a variety of unrelated sub-contractors on a building alleged to be in the control of the general contractor.

This seems to me to be an incorrect idea, as the intention of the clauses in the contract appears to fit the modern conception of the best method in which to erect a large building.

Conditions may not have been, and probably were not, the same throughout the country, but up to the beginning of this century in the North of England no building was let to a single contractor. Each trade was dealt with separately, and a whole series of contracts divided into bricklayer, mason, carpenter, plasterer, painter, etc., were let under the control of the architect. About 40 years ago this method changed, and we had general contractors who employed every trade, and who entered into a complete contract to carry out the work, and at this date it was true to say that sub-contracting was practically non-existent. The wheel turned again, and the largest contracts are now let to builders who are in the main organisers. They rarely employ directly more than excavators, bricklayers, and possibly carpenters and joiners if they happen to have a good joiner's shop. All the remaining trades are sub-let.

As it is said that the man in the street is supposed to have the Government he deserves, so it is with his architecture, and the awakening interest in civic architecture leads me to hope that the demand for quality will increase, and that official architects, with the support and encouragement of this Institute, will be found capable of supplying this demand with adequacy and honour to the profession to which they are proud to belong.

Discussion.

In the course of the discussion which followed the reading of the paper, MR. J. J. ROBINSON, President of the Royal Institute of the Architects of Ireland, said it was thought by some that the employment of official architects tended to reduce employment for those who selected the thorny road of practice, but there was in that attitude the obvious fallacy that if the official architects were not engaged officially they would in large proportion be practising, and on balance, he submitted, there would not be so much difference or much benefit to the profession as a whole.

The profession in Ireland owed much to official architects. They had adorned the highest offices it was in their power to bestow, and their loyalty to the high principles of the profession and to their professional colleagues outside was inestimable, and as long as their records remained it would not be forgotten.

"In performance," the speaker concluded, "their name stands high, and the great undertakings in Dublin of the Custom House, the Four Courts, and the G.P.O., amongst many other not so well known, but of equally high quality, will always be monuments to their skill and competence."

THE BANQUET

MR. J. J. ROBINSON, P.R.I.A.I., presided over a gathering of over 300 at a banquet held on Thursday, June 22, at the Mansion House.

The toast of "Ireland" was proposed by MR. HUBERT LIDBETTER, F.R.I.B.A., who asked the company to drink to a country "united and undivided."

MR. O'DERRIGG, Minister for Education, in reply, congratulated the Institute on reaching its centenary, and extended a welcome to the visitors from Great Britain. He hoped that the R.I.A.I. would continue to prosper in the future and do magnificent work, such as it had been doing for the people of that country. The members had been forming public opinion in matters of architecture and helping to develop standards of taste. They had given valuable assistance in town planning, as a result of which the countryside should be made more beautiful, the capital city improved, and they would get rid of some of the atrocities which had disfigured the landscape. The speaker referred to the modern trend in architecture, and said that they had always prided themselves on an outlook in which spiritual values transcended material values.

MR. H. S. GOODHART-RENDEL, P.R.I.B.A., proposed the toast of the "Royal Institute of the Architects of Ireland." He said that that was an historic occasion, and they had come from England to do honour to the Irish Institute. The work of their first century had been most energetic and courageous. He said that he would like to mention one Dublin building which seemed frequently to be overlooked. He referred to the basilica on Stephen's Green, the University Church, of a design astonishing for its date—the 'sixties of last century. It was designed by that remarkable amateur architect, John Hungerford Pollen.

MR. J. J. ROBINSON, P.R.I.A.I., in replying, expressed his thanks for the words in which the toast had been proposed and the warmth with which it had been received.

The toast of "The Guests" was proposed by MR. VINCENT KELLY, F.R.I.B.A., F.R.I.A.I., who said that there had been 100 years of unbroken peace between the Royal Institute of British Architects and the Royal Institute of the Architects of Ireland. Between their two countries during that period there had been some slight disagreements. Perhaps both countries, looking at the past, might now say to one another: "If there is anything I have done for which I am sorry, I am willing to be forgiven." As the years went by feelings of good will and affection grew stronger between the British and Irish peoples. He referred to the presence of the president of the Royal Society of Ulster Architects, and said that they welcomed any gesture to dispel the unkindly fate which had brooded over the two parts of their country and frustrated their natural unity.

MR. C. G. SOUTAR, F.R.I.B.A., M.P.T.I., in reply, said that the wedding of the British and Irish Institutes had proved to be a fruitful union. As he walked round Dublin that day he had realised that the architects of Ireland had give it a capital worthy to compare with any of the great cities of Europe.

The LORD MAYOR also replied.

"GARDEN AND LANDSCAPE"

AN EXHIBITION AT THE R.I.B.A.

An exhibition entitled "Garden and Landscape," organised by the Institute of Landscape Architects, is now on view at the R.I.B.A. It was formally opened last week by the Hon. David Bowes-Lyon, of whose remarks a report is given at the end of these notes.

It was full time that we had another exhibition of this kind, for gardens are becoming increasingly popular. The English tradition is probably as good as any in the world. In the past there were many eminent garden designers, and wealthy persons introduced new trees and plants from "foreign parts," many of which are to be seen as specimen examples to-day, having survived a century or more. A love of the garden seems to be implanted among all classes. One has only to look from a railway train passing through any new district to see with what skill and taste the small gardens are laid out.

This present exhibition is very informative and instructive, and the houses and buildings are seen in their proper settings—that is, the gardens are matured. One need do little more than call attention to the very excellent examples on view, many being illustrated by fine photography. The schemes and lay-outs range from the small-house garden to those of a much greater magnitude and wider purpose.

What may be termed a new subject is the traffic island and roundabout. This offers new scope for interesting treatment. Its possibilities are now becoming apparent (if not yet fully matured) on our great new roads. These lay-outs are still in an experimental stage, but they are quite promising, and bid fair to become attractive features, breaking the monotony that is characteristic of many of these new roads.

We note a Miners' Welfare recreation ground at Hamstead (shown by an excellent model), affording evidence of the enlightenment of the age in providing for the enjoyment and health of the workers.

It may be added that modern sculpture is used in the gardens of the modern houses, which is as it should be, while traditional building demands traditional sculpture. Credit must be given to the designers for their excellent schemes, be they small or large, roof garden, park or island lay-out.

Marjorie Meggitt's wooden figure, "Daphne," has its charm; it is well set beneath a tree. The figure is very attenuated, but coarse in the ankle, a treatment necessitated, no doubt, by the need for rigidity.

The exhibition remains open until July 1, from 10 a.m. to 8 p.m. (Saturday 5 p.m.). and admission is free.

THE OPENING ADDRESS.

Before opening the exhibition the Hon. David Bowes-Lyon, in the course of his address, said: "There exist to-day a number of institutions whose principal duty it is to safeguard the national landscape. There is, of course, the National Trust, and the Council for the Preservation of Rural England, and I need not remind you of the great work and great place filled by these two societies alone. I would point out, however, that they are entirely engaged in the preservation of the past, and the past only. In addition to these landscape societies I would mention two other great bodies which are concerned with gardens and buildings. One is the Royal Horticultural Society and the other the Royal Institute of British Architects, the hospitality of whose building we are enjoying this afternoon. Here again we have on the one hand a body whose avowed work is concerned in stimulating the interest in plant cultivation, while on the other hand the Royal Institute of British architects is so largely occupied in the design and construction of buildings that from neither body has landscape received the attention it deserves. It will therefore be seen that this Institute is filling a great want in that its principal function is primarily concerned with the creative aspect of landscape design."

The speaker traced the history of landscape in this country, and went on to say that in the nineteenth century there was considerable hesitation as to the view of landscape and garden design. On the one hand Paxton laid out the magnificent formal gardens at the Crystal Palace in a purely Victorian style, and on the other hand the escapists from the Industrial Revolution built themselves romantic dwellings with equally romantic gardens that to us to-day seemed incredible in their aspiration, and later there emerged the comparative modesty of the rock garden on a grand scale and such features as the herbaceous border.

During that century and the present century wholesale destruction of the countryside was taking place, apparently unobserved. First the introduction of railways, and later the indiscriminate development of housing without any planning, did incredible harm. It was only after the war that people became suddenly conscious of this insidious destruction, and then prompt action was taken by the voluntary societies in trying to preserve and protect what was left of the best of the country. Preservation and protection by themselves, however, were not enough, because no country could remain static. Certainly we knew that Nature, if left to herself, would run wild, and we also knew that mankind could not stand still, but must also grow and develop. It was with particular regard to this development that the exhibition was concerned. The Institute of Landscape Architects was wholly concerned with the creative side of landscape in all its forms. Its aim was to incorporate all the aspects that had been considered to-day; on the one hand to draw the architect's attention to the intense beauty of nature, and on the other hand to draw the attention of the horticulturist to the artistic rather than the scientific merit of plant forms.

The great eighteenth-century estates with their landscapes were daily being broken up and sold for speculative housing. The redistribution of wealth meant the rise of a new architecture in the form of communal schools, civic centres, road houses, and the like, and it was of inestimable importance that the aspect of the landscape should be most carefully considered in the planning of such architecture, and it was there that the speaker believed some form of co-operation between the great architectural and horticultural societies would be beneficial. He was certain that one could help the other, and that with a common ideal they would see fewer good plants destroyed by bad architectural planning of gardens, and fewer well-designed gardens poisoned by wrong planting.

HOUSE AND GARDEN AT POOLE,

for which Mr. Oliver Hill, F.R.I.B.A., is the architect. The work is included in the Garden and Landscape Exhibition.

CORRESPONDENCE

R.I.B.A. Elections.

To the Editor of *The Builder*.

Sir,—I am pleased to find that in his letter to *The Builder* of June 24, Sir Ian MacAlister does not suggest that any one of the candidates, nominated by the Representation Committee, had canvassed for a single vote. Sir Ian states that I am mistaken regarding "nomination." This, however, does not appear to be the case. On the other hand, I fear that Sir Ian has not fully appreciated my point. My view is that, if there is anything objectionable in the nomination of candidates for election by Committees, then such procedure constitutionally by the R.I.B.A. Council is equally objectionable. I do not contend that exception can properly be taken to such action either by the Council or any Committee. I take the view that, if exception can be taken to such procedure, the constitution of the Royal Institute should be altered, so as to render it impossible for the Council to be called upon to act in a manner that is not above criticism in this respect. By-laws, however carefully drafted, cannot make an improper course of procedure into one that can be commended.

The simple remedy appears to be to agree that each section of members of the Royal Institute shall have a definite number of seats on the Council. To be logical, the Council should itself cease to make nominations, if it objects to such action by Committees.

Phillip S. Phillips,
Hon. Secretary (*pro tem.*) to the Representation Committee.
"Green Trees,"
Harefield Place, Uxbridge.

BANKRUPTCY OF BUILDERS

We give below a further selection of letters received on the subject of "Bankruptcy of Builders." Editorial comment appears on page 1211.

To the Editor of *The Builder.*

Sir,—The correspondence in your last issue indicates that under the particular form of building contract now in use, there is some difference of opinion concerning the position of the architect.

Let it be assumed for the purpose of this discussion that the architect is an ordinary fellow, such as myself. He is not a silly ass or a crook. He is certainly not a Universal Aunt. He is a harassed individual endeavouring to earn a decent livelihood by designing and supervising the erection of buildings with a minimum of fuss and bother, within a stated time and a stipulated expenditure. His office is not a hospice where wandering troubadours of the building trade possess some prescriptive right to drop in at any time out of the rain, to tell a merry tale and cross-examine him concerning the private projects of his clients.

Nowadays, about half the work included in the average building contract is done by specialist sub-contractors. These specialists are usually nominated either by the employer or the architect. The rest of the work is specified to be executed by the contractor, but few contractors would care to deny that, in actual practice, they sub-contract a considerable amount of this work, with or without the consent of the architect.

When a contractor (whom we will call Doc) applies for a certificate on account of work done, he submits a statement indicating how his figure is computed. The architect duly issues his certificate, and, when forwarding it to Doc, notifies him that there are specific sums included in the amount of that certificate payable to Happy and Sneezy and Grumpy on account of their respective sub-contract works executed for him.

As Happy and Sneezy and Grumpy are very busy fellows they rarely trouble to notify the architect when they apply to Doc for money. The architect naturally assumes that Happy and Sneezy and Grumpy are far too busy to be bothered, and, in his turn, rarely troubles to notify them when he has issued a certificate to Doc, which includes sums of money payable to them.

If only Happy and Sneezy and Grumpy could be persuaded to tell the architect *before* they apply to Doc for a payment, and send a postcard to him when they receive it, the whole matter would be simplified.

The architect would know whether the stipulations he made to Doc when he issued his certificate had been met, and (as he is a sensible architect) would refrain from issuing any more certificates to Doc *until* they had been met.

If any specialist sub-contractor does not care to work under any particular contractor he should tell the architect before he accepts a sub-contract, and not afterwards.

The position of the unofficial sub-contractor who accepts work from a contractor without the consent in writing of the architect does not concern the architect. I do not, myself, regard the R.I.B.A. Form of Contract as the perfect document, but it is, at any rate, quite clear on that point.

It is, I am sure, a fallacy to treat the current R.I.B.A. form of building contract as inspired literature that must be accepted in its entirety without alteration.

For instance, if I were a contractor I should take strong exception to a document containing any such phrases as "mutatis mutandis." In the building trade we do not ordinarily converse in Latin, and even though the employer might be a bishop or a dispensing chemist and the architect a professor, I think I should feel disposed to invite them to lapse for a few moments into our native English whilst discussing a business matter.

Between men of good will, however, the signature of any type of building contract is a mere formality, so long as its phraseology conveys the same meaning to all the contracting parties.

Unfortunately, the form now in current use is so full of pompous verbiage that misunderstanding can even arise concerning the exact meaning of such a very simple term as "cash discount."

F. R. Jelley.

Windsor House,
83, Kingsway, W.C.2

To the Editor of *The Builder.*

Sir,—The indignation expressed in your columns by specialists and sub-contractors at the treatment they receive all too frequently at the hands of defaulting contractors is well understood and to some extent shared by the Chartered Quantity Surveyor, but the remedy is not quite so simple as suggested by Mr. W. W. Aumonier.

To give effect to his proposal the standard Form of Contract and the contracts in general use by local authorities would need to be redrafted by reason of the fact that all powers in connection with the issue of certificates direct to sub-contractors are vested in the architect, *vide* Clause 15 (b) of the present Standard Form. In any case, the action could not extend to the drawing of cheques, but only to the issuing of separate certificates in favour of each specialist who was entitled to payment, which in turn would be presented to the employer.

Although in general practice every effort is made by the surveyor to safeguard the interests of the sub-contractor and the receipts for sums previously certified are scrupulously examined before the issue of a further certificate, there must be, under the present rules, an interim period during which the contractor has received payment on behalf of himself and others and during which period he has bound himself under the contract to discharge the payments to sub-contractors. Normally these amounts should not represent more than one month's work, but with sub-contracts such as lifts, where the bulk of the machinery may be delivered during one month, this period may be a very vital one for some particular firm.

A feature which does rather surprise me is that so many specialists and merchants continue to give credit to contractors who have been known to be in difficulties for a considerable time, and in many recent cases the loss would have been avoided had common prudence been exercised and ordinary trade inquiries been made.

The remedy seems to lie, therefore, with: (1) More careful scrutiny of the financial status of the contractor by the building owner before signing the contract, and (2) Better trade protection organisation by sub-contractors and specialists.

E. C. Harris.

3, Bedford-square, W.C.1.

To the Editor of *The Builder.*

Sir,—Mr. Cecil Kahn and those who have followed him have rightly deplored the losses caused to sub-contractors by the bankruptcy of builders. But bankruptcy, regrettable though it may be, occurs in all trades; and, in attempting to frame rules to guard against it—rules which might prove ineffective, and which might well be hampering to honest business—we are in danger of losing sight of what, to my mind, is the essential point, and one moreover that is peculiar to the building trade.

Briefly, it is this. To whom is the sub-contractor to give credit—to the builder or to the building owner? Unhappily, as matters stand, the answer is—to both. The builder's liability to his sub-contractors is limited to the amounts that he shall have received on their behalf from the building owner; while on the other side there is no privity of contract between the building owner and the sub-contractors, so that money paid to the builder for the account of the sub-contractors, but not paid over to them, is as good as lost. Thus, should either builder or building owner fail, the sub-contractor takes the loss.

Such a situation must be rare outside the building trade; and before we talk of paying sub-contractors direct we must consider the question: To which of the two, builder or building owner, would we rather give credit?

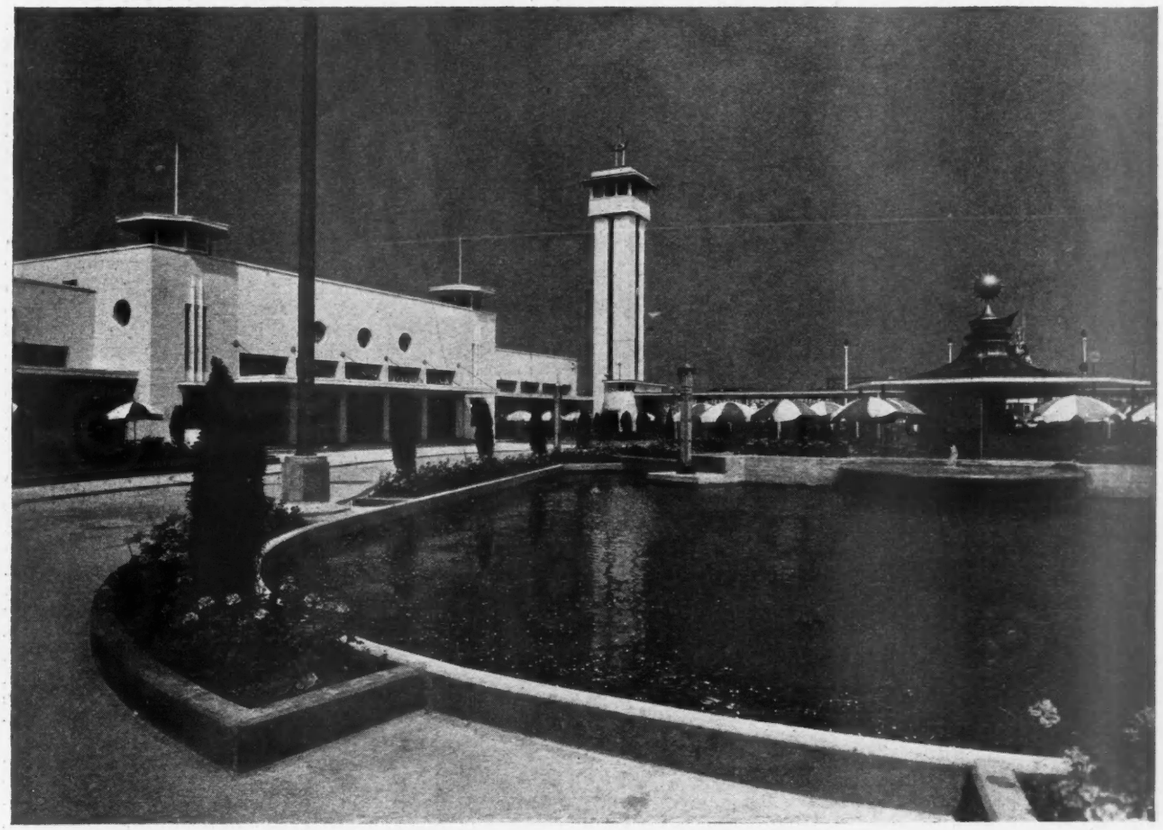
I feel that if we pin our faith to payment direct from the building owner we are exchanging the debtor we know for one we don't. After all, we do know the reputation of the builders (and there are very many builders whose names are a guarantee of good faith and sure payment); we can without much difficulty ascertain their credit ranking; and, if the worst should occur, they will have some assets in their plant and stock. If there is any "financial jugglery" the building owner, operating on mortgages and hope, is a more likely suspect than the builder. I suggest, therefore, that we look, as in other trades, to our direct customer, the builder, for payment. This means deleting from the sub-contract the clause which limits the builder's liability to moneys received by him from the building owner in respect of the sub-contract work. The builder's position with respect to sub-contractors will then be the normal relation existing between purchaser and supplier in other trades; and, in the event of the building owner going bankrupt, the builder would be in the position of any other trader who has ordered special goods for a defaulting customer, and the same remedies would be available to him.

If, however, we are to retain the present half-and-half system, let us go back to the issue of individual certificates direct to the sub-contractor. The growing practice of issuing a block certificate direct to the builder without notifying the sub-contractors leaves the sub-contractor in the dark, and can materially assist dishonest practices; for, unless he worries the architect at intervals, the sub-contractor does not know on what date the certificate was issued, how much was included therein for him, or if, indeed, any certificate has been issued at all. The knowledge of the date is important, for ignorance of it robs the sub-contractor of his one effective remedy, that of withdrawing men and materials from the job if payment is not made within the proper time.

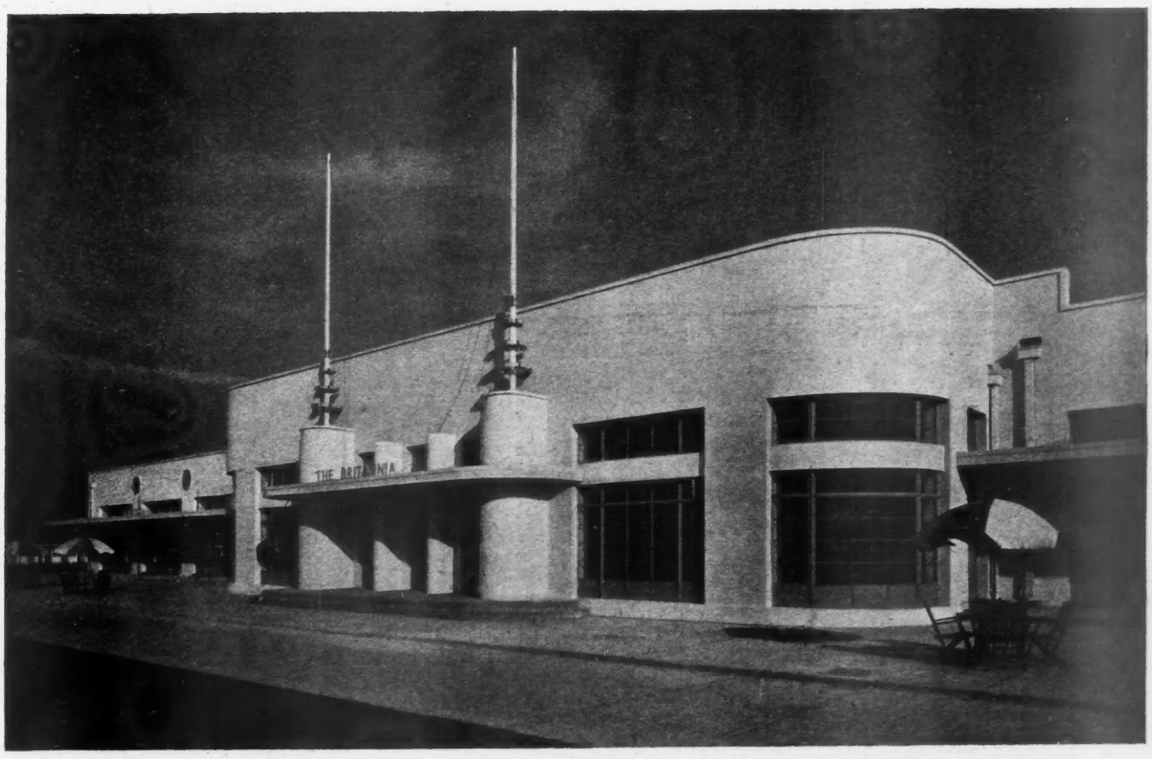
(*Continued on page* 1233.)

PRESTATYN HOLIDAY CAMP, NORTH WALES.

MR. WILLIAM H. HAMLYN, F.R.I.B.A., ARCHITECT TO THE L.M.S. RAILWAY.

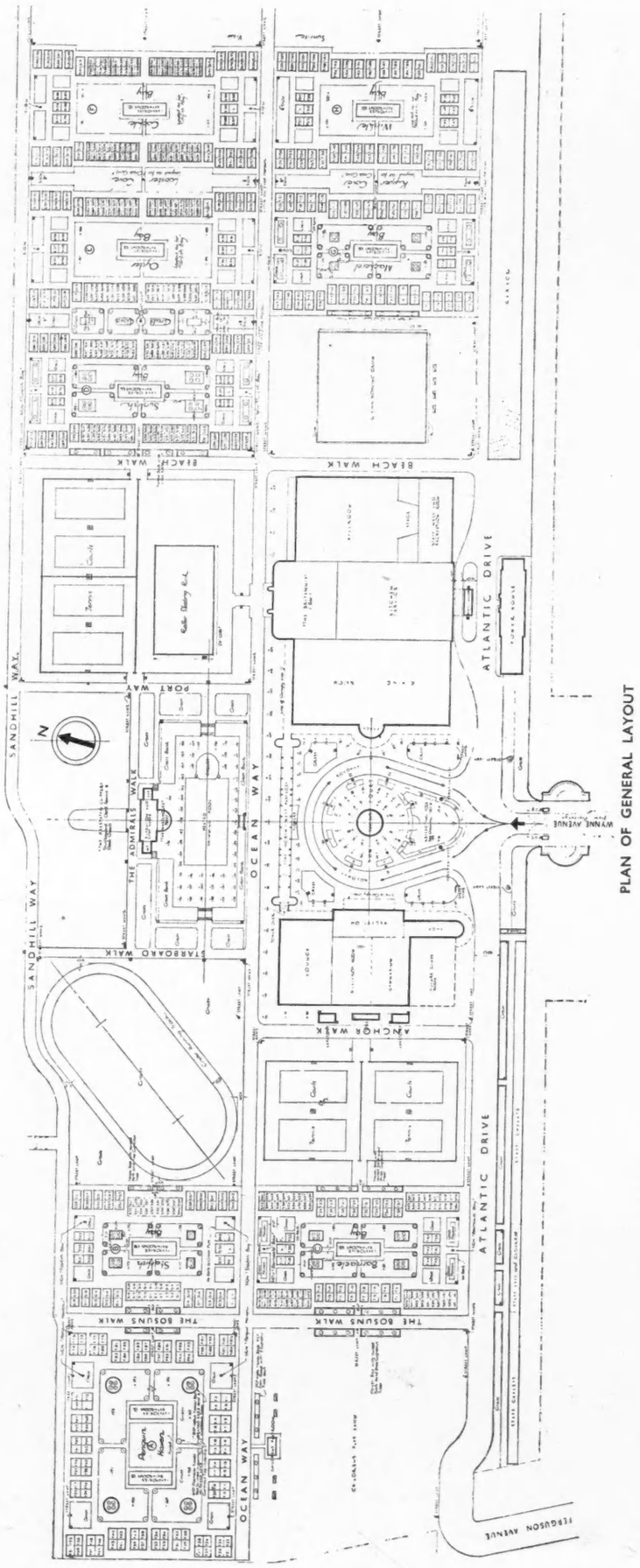


VIEW ACROSS THE "SUN COURT," TOWARDS THE RECEPTION HALL.



ENTRANCE TO "THE BRITANNIA" BAR.

PRESTATYN HOLIDAY CAMP, NORTH WALES.



PLAN OF GENERAL LAYOUT

THE site of the camp is situated on the north side of Victoria-road, slightly to the west of Prestatyn and about two miles from Rhyl, the ground being almost dead level and suitable for the layout of a camp. Access to the site is by a road known as Wynne-avenue, which meets the central axis of the site, and also at the west end by another road known as Ferguson-avenue.

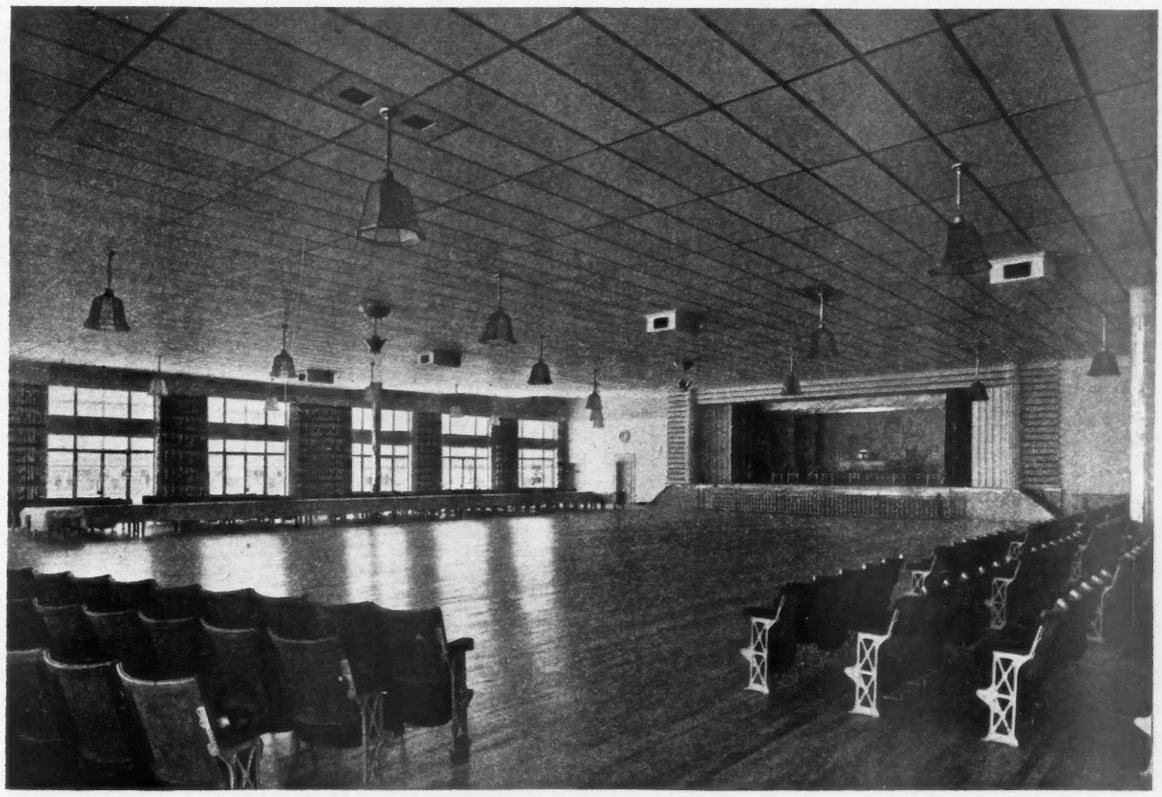
The focal point of the plan is a large entrance court known as "The Sun Court," 225 ft. by 190 ft., on either side of which are the two principal buildings, that on the west side containing the reception hall, 81 ft. by 32 ft.; the camp shopping centre, 70 ft. by 20 ft. 6 in.; club lounge, 79 ft. by 60 ft., with buffet; a billiards room, 77 ft. by 46 ft.; and gymnasium, 77 ft. by 44 ft.

The building on the east of "The Sun Court" comprises the dining room, 178 ft. by 95 ft., in which the whole of the visitors—1,750—can be seated at one time. There is a platform planned in a recess where the orchestra will play at mealtimes. Between the dining-room and the ballroom is situated "The Britannia," a lounge bar, measuring 89 ft. by 63 ft. On the west side is the ballroom and concert hall, 111 ft. by 95 ft., the stage being equipped with suitable scenery and lighting effects for small variety performances and plays. In the centre of the building are the kitchens, larders, stores, etc., 135 ft. by 89 ft., capable of producing meals for 2,000 persons at one meal. Adjoining the kitchen and behind the ballroom is the staff mess and recreation room, 111 ft. by 39 ft. The overall size of these buildings is: Dining block, 281 ft. by 179 ft.; reception block, 212 ft. by 112 ft. Circulation is provided between both buildings by means of a covered way known as "The North-West Passage" and forming the northern side of "The Sun Court."

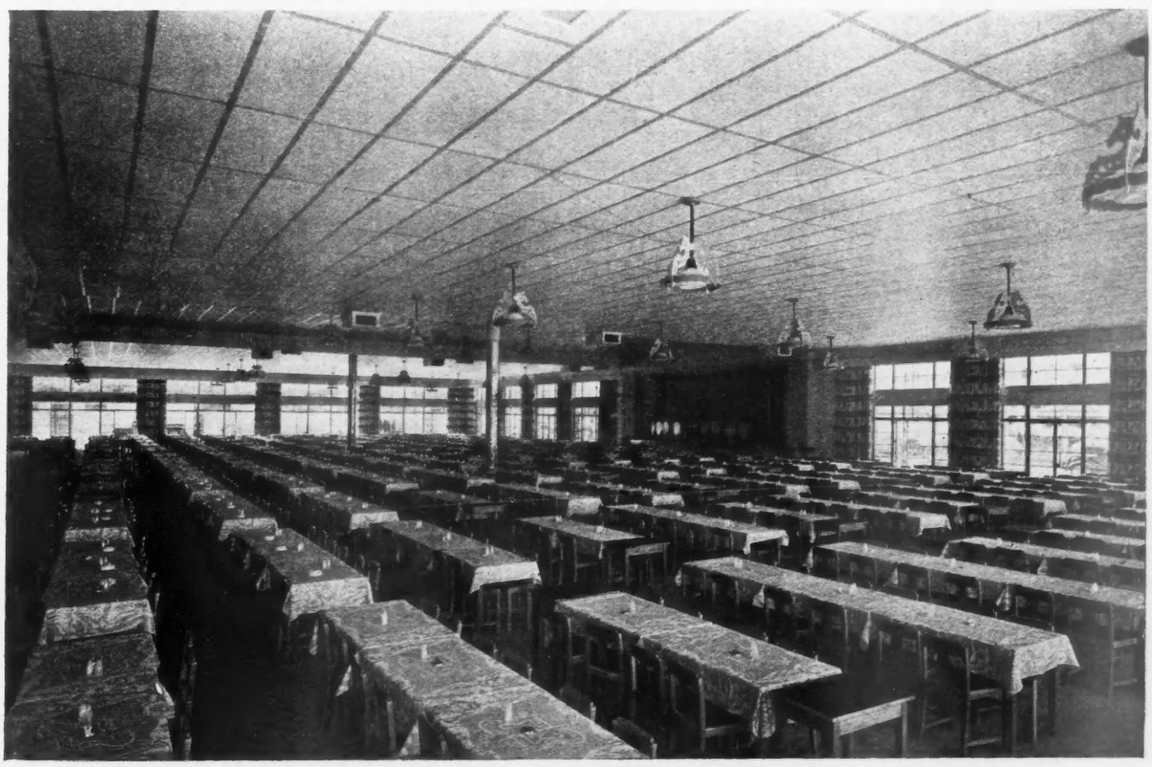
On the central cross axis and situated northwards of "The Sun Court" is the swimming pool, with its surrounding terrace raised 5 ft. above camp level. The terrace is paved with coloured concrete slabs laid in a geometrical pattern and fitted with sockets for umbrellas. On the north side of the swimming pool is a building which comprises the filtration plant, lavatories for both sexes, a cocktail bar known as "The Wheel House," a small suite of rooms for the camp controller, and on top of the building the camp controller's observation cabin. This building forms part of a whimsical vessel known as "The Prestatyn Clipper," and, by means of companion ways, is linked with the main deck raised a few feet above the lawn at the back of the building.

In the immediate vicinity of the main buildings and surrounding them are large areas laid out as lawns for croquet, clock golf, tennis courts, roller skating rink, bowling

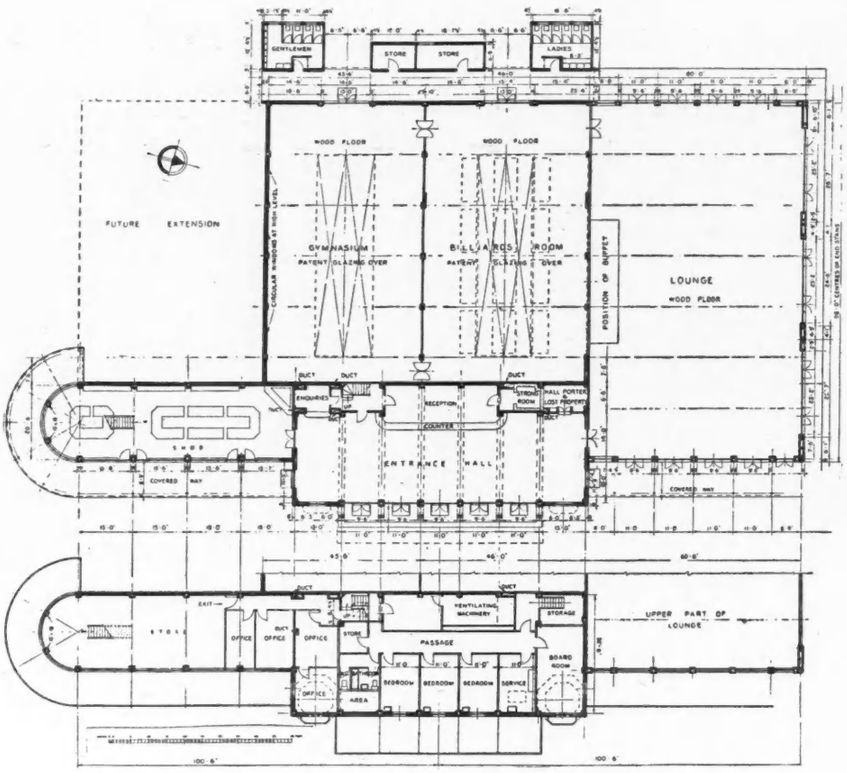
MR. WILLIAM H. HAMLYN, F.R.I.B.A., ARCHITECT TO THE L.M.S. RAILWAY.



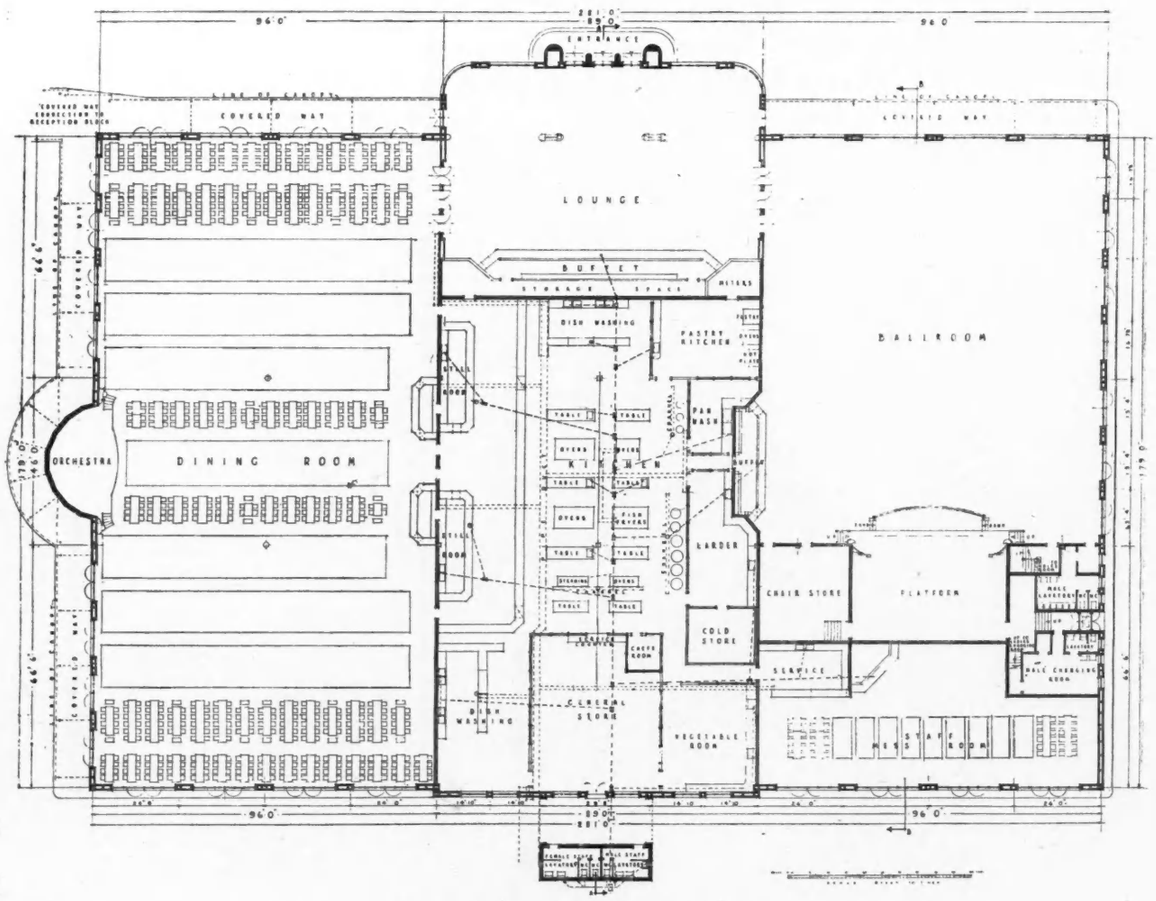
THE BALLROOM.



THE DINING HALL.



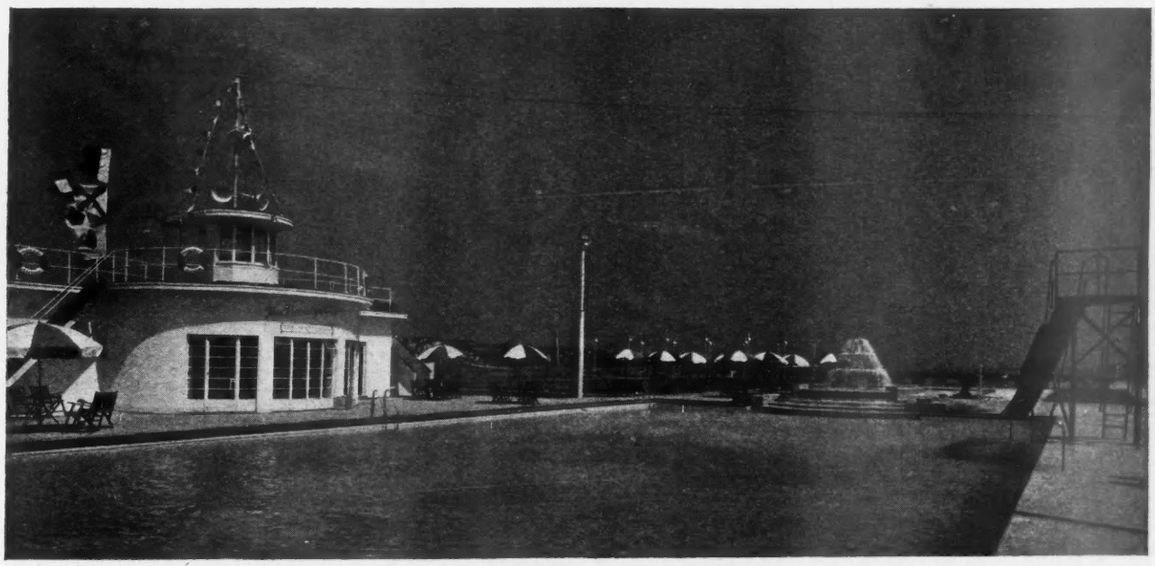
PLAN OF RECEPTION HALL AND RECREATION, ETC., BLOCK.



PLAN OF DINING-ROOM AND BALLROOM.

PRESTATYN HOLIDAY CAMP, NORTH WALES.

MR. WILLIAM H. HAMLYN, F.R.I.B.A., ARCHITECT TO THE L.M.S. RAILWAY.



THE SWIMMING POOL.

green, physical exercises, cinder running track and tennis volley practice pitches. To the east and west of these large areas are the chalets.

The unique aspect of this portion of the camp is that the chalets are planned in courts instead of monotonous rows. There are two kinds of court: the large court, in the centre of which is a building comprising lavatory accommodation for both sexes, slipper bath, two showers, thermostatically controlled, and wash basins with running hot and cold water. These large courts are paved with cement paving to permit of considerable traffic to and from the bathrooms, etc. Turf would be worn off and become unsightly. The smaller courts, where traffic is restricted to ordinary circulation, are laid out with turf and flower-beds.

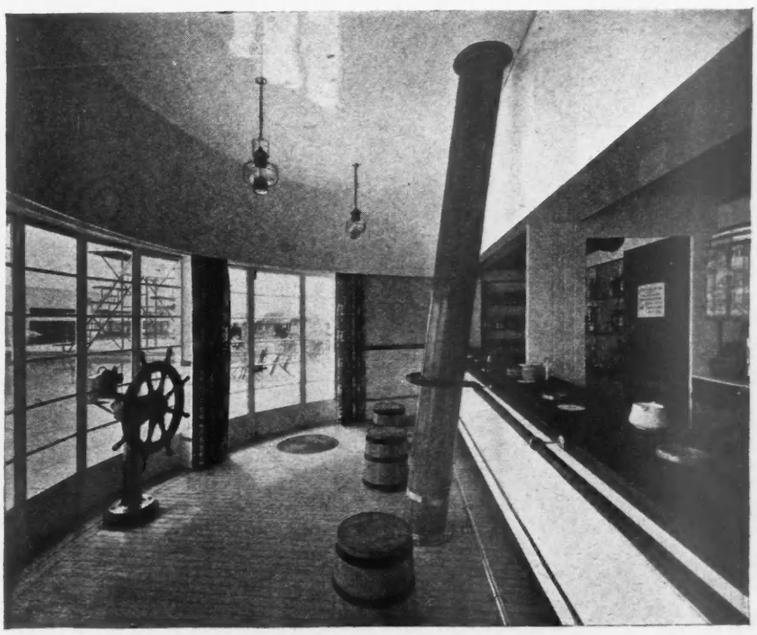
The chalets comprise three kinds, the single chalet, a chalet with two beds and the chalet with a double bed, single bed and cot, the latter being for families and grouped around a large courtyard on the west extremity of the camp known as "Penguin Haven." Adjoining "Penguin Haven" is the children's play lawn, fitted with roundabouts, swings, sand-pit, and an attractive playroom. The remaining buildings on the site include chalets for 200 staff, a first-aid centre, and a nurse's sleeping quarters adjoining.

The power house building also embraces a large linen store, baggage store, and electrical sub-station. Adjoining this building is a laundry, where lady visitors may wash and iron simple garments. A covered car park, 440 ft. by 38 ft., accommodates about 150 cars. There are also two small kiosks on the site for the sale of sweets and tobacco.

At the junction of the North-West Passage and the reception building is the observation tower. This feature, whilst forming an architectural focal point in the façade of the main buildings, enables visitors from a height of 60 ft. above the camp to obtain extensive views over land and sea.

On a clear day such points of interest as Snowdon, the Isle of Man, Blackpool Tower, etc., may be observed. Likewise there is obtained a full bird's-eye view of the camp. To facilitate observation, four high-powered minoculars are fixed on swivel arms at four stations on the look-out platform, and the plate-glass of the windows is specially selected to provide angular vision, without distortion, to 15 diameters magnification. Fixed at each corner in the floor of the tower are clear plate-glass panels, ½ in. thick, to enable the spectator to obtain an unobstructed view sheer down the side of the tower to the ground.

The architect for the camp was Mr. William H. Hamlyn, F.R.I.B.A., architect to the London Midland and Scottish Railway, and the general contractors were Messrs. McLaughlin and Harvey, Ltd., London. A list of sub-contractors will be found on page 1242, and a further description of the camp is on page 1234.

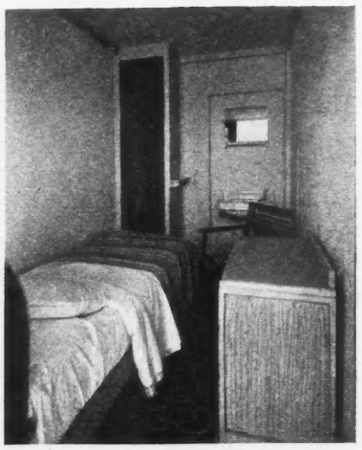


"WHEELHOUSE" BAR, OVERLOOKING SWIMMING POOL.

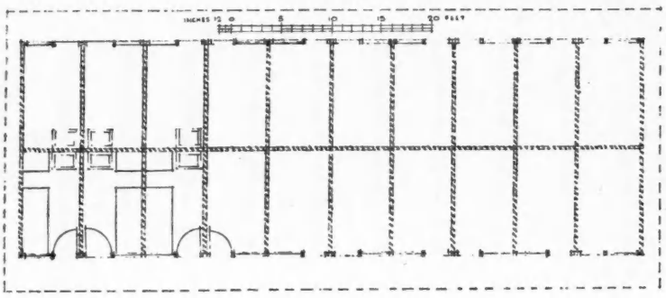
PRESTATYN HOLIDAY CAMP, NORTH WALES.

MR. WILLIAM H. HAMLYN, F.R.I.B.A., ARCHITECT TO THE L.M.S. RAILWAY.

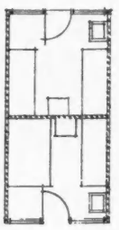
THE RECEPTION HALL.



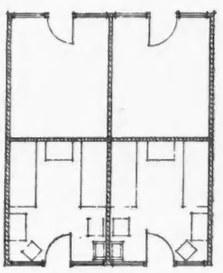
A CHALET, INTERIOR VIEW.



TERRACE TYPE

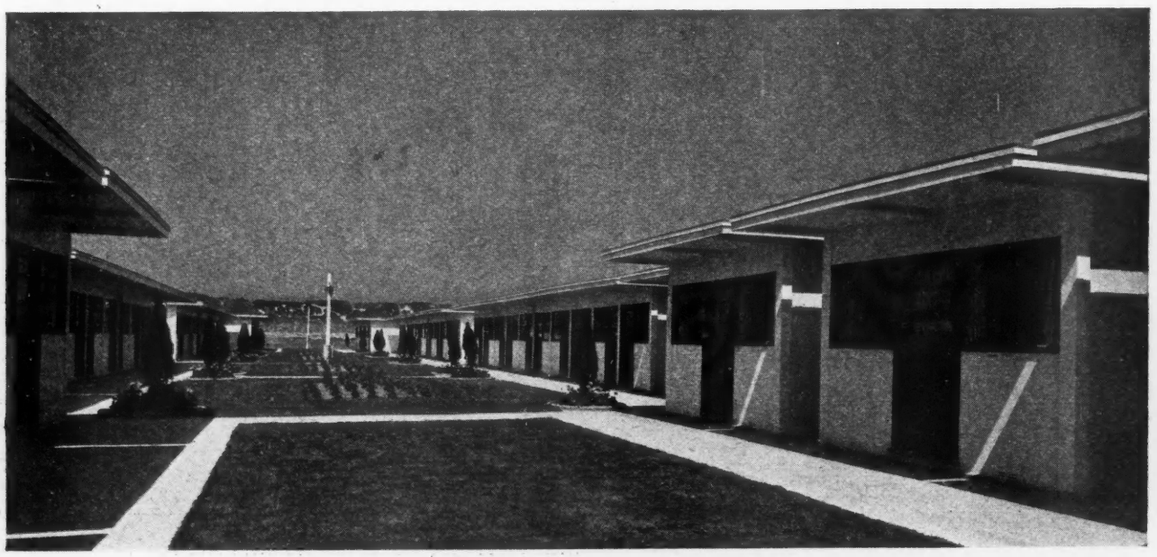


DOUBLE TYPE



FAMILY TYPE

PLANS OF CHALETS.



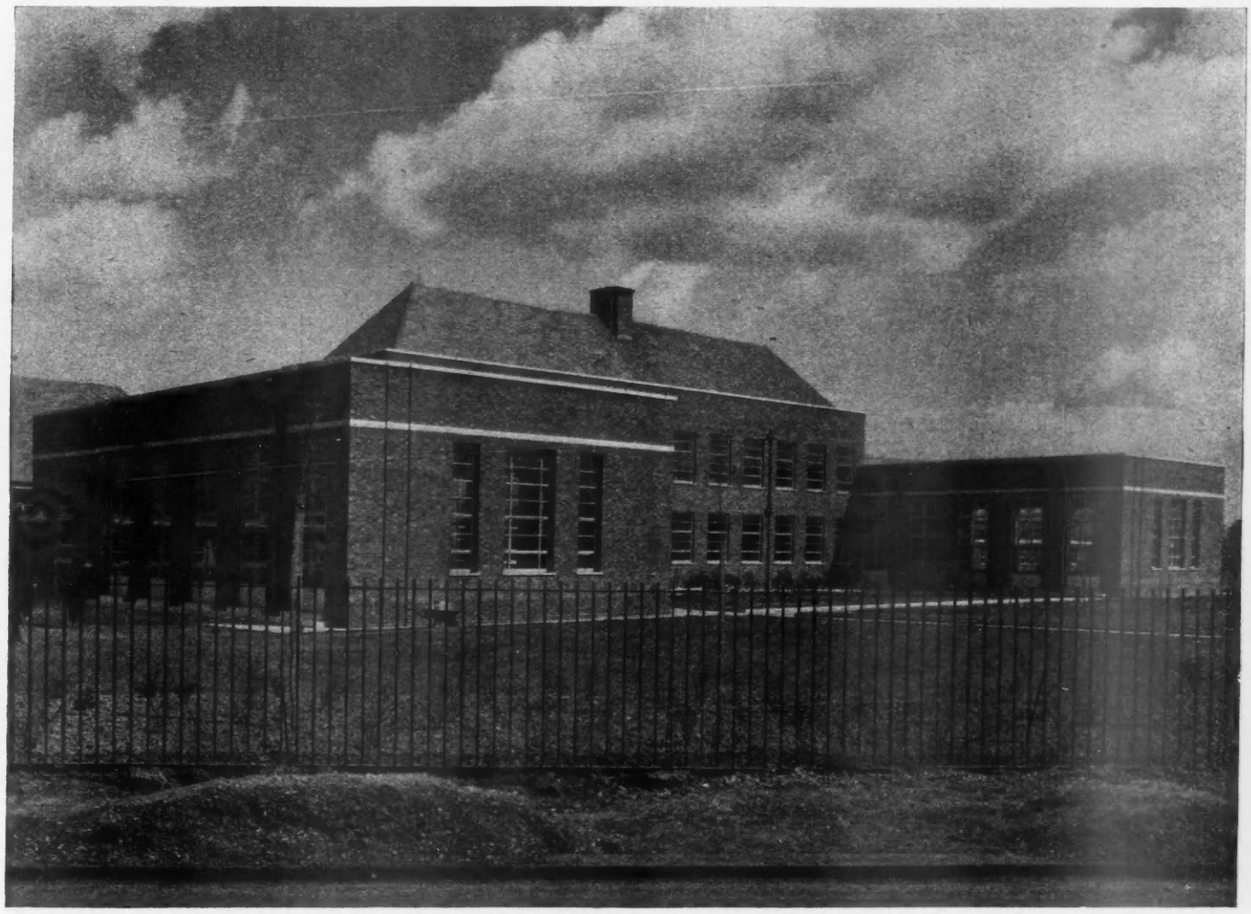
A VIEW OF THE CHALETS.

PRESTATYN HOLIDAY CAMP, NORTH WALES.

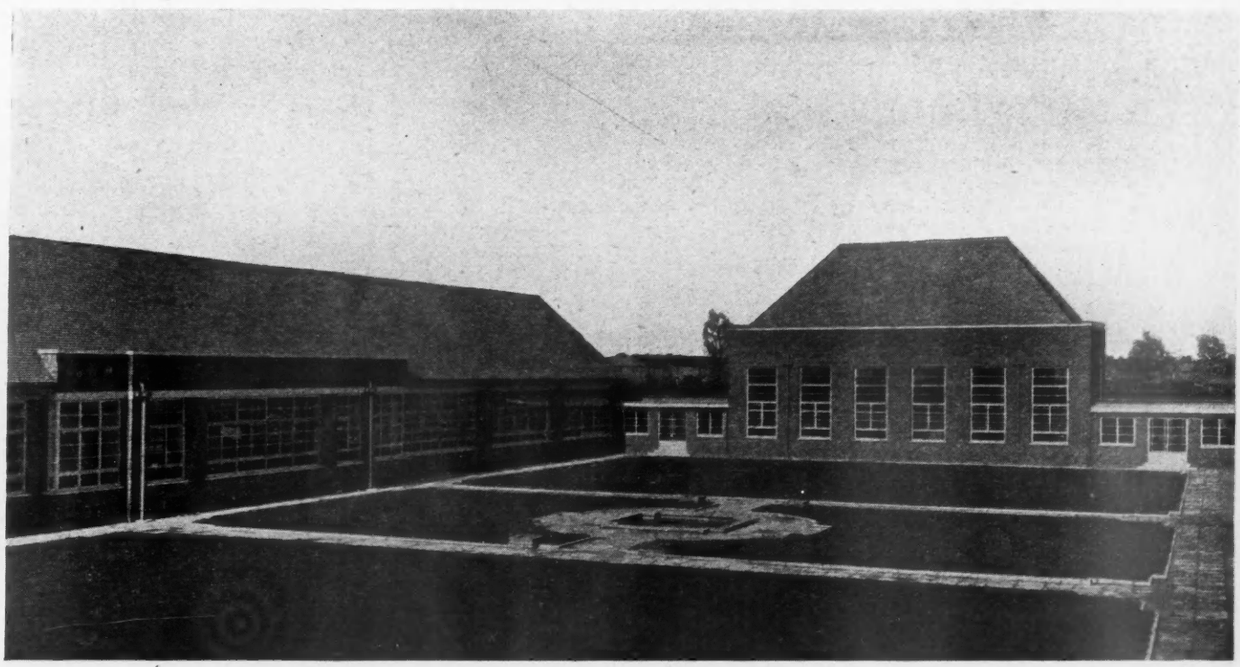
MR. WILLIAM H. HAMLYN, F.R.I.B.A., ARCHITECT TO THE L.M.S. RAILWAY.

THE ALBANY SENIOR SCHOOL AND CLINIC, FOR ENFIELD COUNCIL.

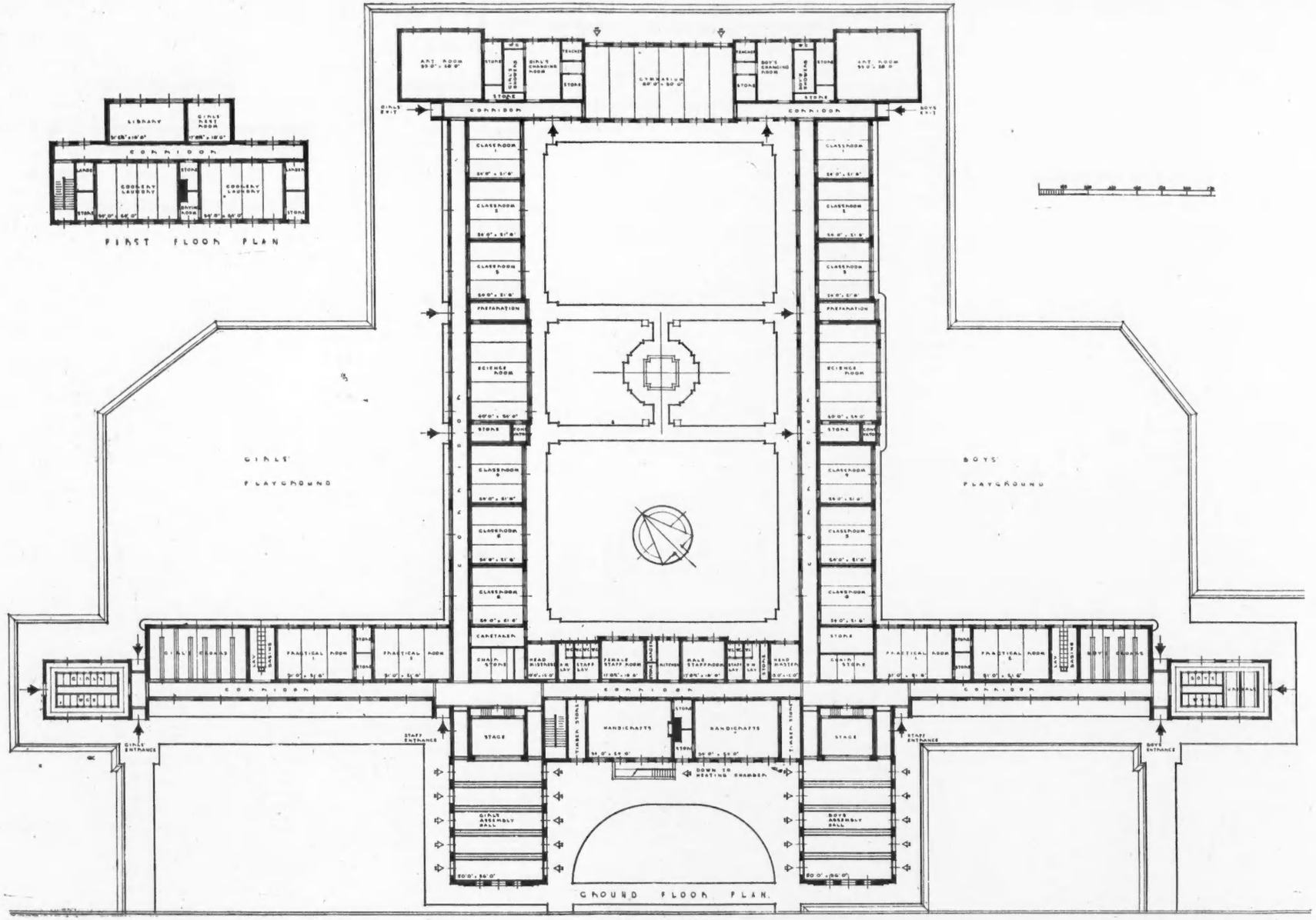
MR. FRANK LEE, L.R.I.B.A., SURVEYOR TO THE COUNCIL, ASSISTED BY MR. H. T. TOWNSEND, A.R.I.B.A.



THE MAIN FRONT OF THE SCHOOL.



THE SCHOOL QUADRANGLE, LOOKING NORTH-EAST TO GYMNASIUM.

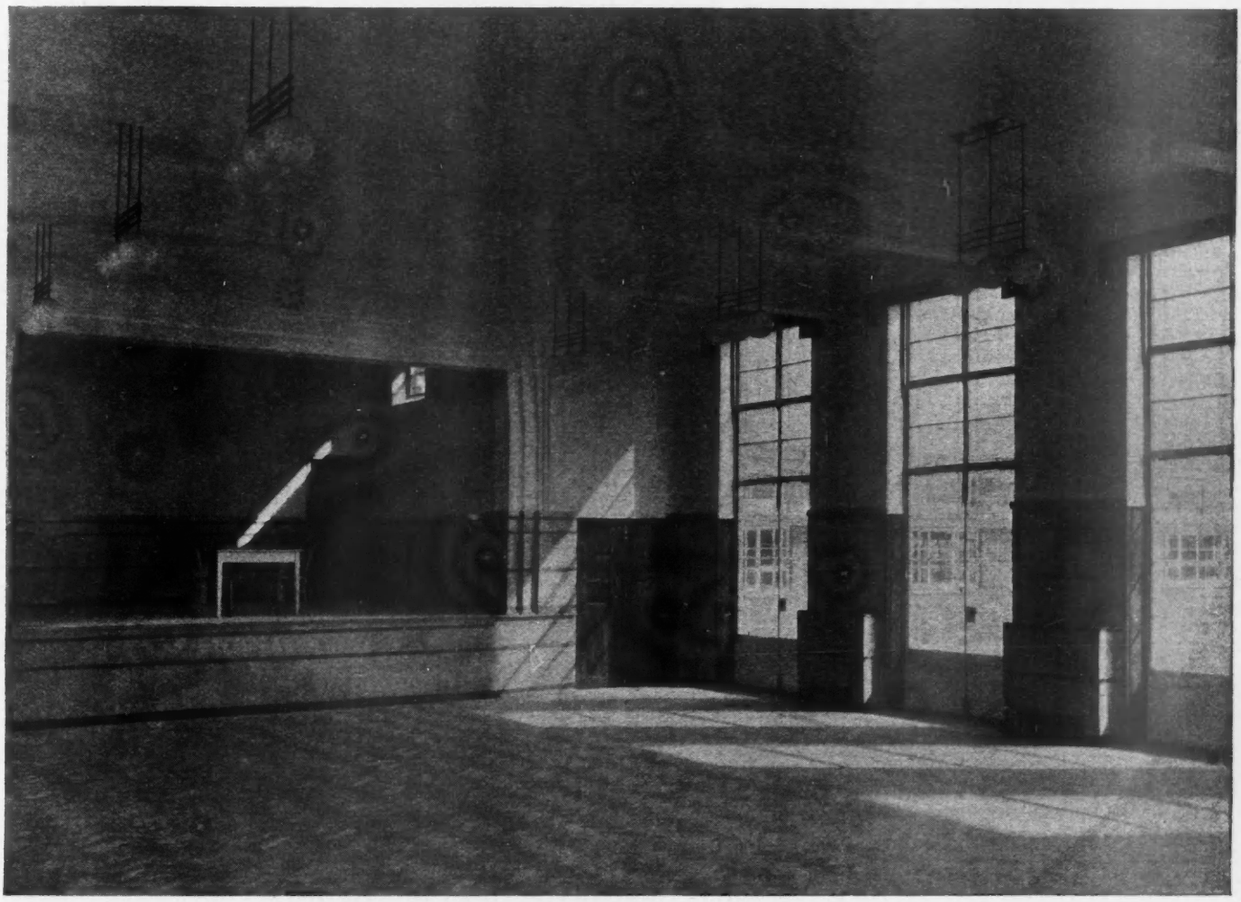


PLANS OF SCHOOL.

THE ALBANY SCHOOL AND CLINIC, FOR ENFIELD COUNCIL. MR. FRANK LEE, L.R.I.B.A., SURVEYOR TO THE COUNCIL, ASSISTED BY MR. H. T. TOWNSEND, A.R.I.B.A.

THE ALBANY SCHOOL AND CLINIC, FOR ENFIELD COUNCIL.

MR. FRANK LEE, L.R.I.B.A., SURVEYOR TO THE COUNCIL, ASSISTED BY MR. H. T. TOWNSEND, A.R.I.B.A.



THE BOYS' ASSEMBLY HALL.

PROBLEM.—A senior elementary school to accommodate 360 boys and 360 girls in separate departments, with common gymnasium. The accommodation to be provided was: 12 classrooms, four practical rooms, two science rooms, two art rooms, two handicraft rooms for boys, two domestic science rooms for girls, two assembly halls, school library, girls' rest room, and usual cloaks, offices, etc.

SITE AND LAYOUT.—The site, about 10 acres, is approximately rectangular in shape, and is bounded on the south and west sides by roads, and on the other two sides by a public recreation ground. Although the ground had only a slight fall, this was towards the south; the road across the southern boundary was higher than the site by about 2 ft. 6 in.

It was decided to place the building upon an axial line bisecting the angle formed by the two roads, as this was the higher portion of the site, and enabled the accepted classroom aspect to be obtained on the wings parallel to this axis.

PLANNING.—Entirely separate assembly halls were regarded as essential by the local education authority, but the gymnasium was to be planned for use by either department. The school was therefore arranged with classrooms forming the two sides of a quadrangle, with the gymnasium at the north end. The assembly halls are adjacent to the south end of the classroom wings, and practical rooms, cloaks, etc., are accommodated in wings at right angles to the classrooms. The quadrangle is simply treated with lawns, and a water pool has been built to provide opportunities for nature study. The corridors communicating with all these rooms are provided with large sliding folding windows in order that at suitable seasons they can be opened to give the maximum amount of light and air.

CONSTRUCTION.—With the exception of the front block, the school is planned on a single floor, and no steel or reinforced concrete framing is used. A feature of the classrooms is a single large window on the south-east side. This is provided with sliding folding leaves to allow of complete and unobstructed opening between the transomes, above and below which are pivot-hung and hopper ventilators. Similar smaller windows are used in all teaching rooms.

The external walls are of cavity construction; internally partition walls are of brickwork. Floors at first-floor levels and flat roofs are of reinforced concrete. The floors at ground-floor level are of concrete, except that in the gymnasium, and the playgrounds are also paved with concrete.

EXTERNAL FINISHES.—Externally the walls are faced with multi-coloured red hand-made stock bricks with picked bricks forming a darker plinth. The pitched roofs are covered with grey-brown "Stamfordstone" tiles, and precast artificial stone is used in copings and sills.

INTERNAL FINISHES, ETC. — The assembly halls have been panelled to a height of 7 ft. in Australian silky-oak, with teak linings and inset bands. Changing rooms, lavatories, w.c.s, have tiled dadoes, and teaching rooms and corridors have cement dadoes and plastered walls for painting.

Generally, all teaching rooms and halls have teak-block floors; corridors, changing rooms, cloaks, lavatories and w.c.s are paved with red asphalt with a black border and covered skirting. Floors of stores, larder and kitchen have heather-brown quarry tiles pointed in white cement, and all win-

dow sills internally are finished with tiles.

The gymnasium floor is of maple boards on joists and sleeper walls. The classrooms are equipped with built-in cupboards and blackboards, and all doors are painted flush veneered type, except to assembly halls, which are faced in teak. Metal windows throughout are purpose-made with surrounds in standard rolled steel sections.

SERVICES.—The heating of the school is by low-pressure hot-water boilers. The twin boilers are fired by automatic stokers, and a separate system provides hot water to sinks and basins. The building is also equipped with hose-reel installations for fire protection, and an electric call bell and fire alarm system. All classrooms are provided with 5-amp. and 15-amp. electric plugs, and the blackboards are illuminated by cornice lighting above the blackboards. Semi-indirect lighting from enclosed sphere fittings is universal throughout teaching rooms.

The Clinic.

The school clinic has been erected on the site to provide minor ailment and dental treatment for school children within a convenient radius of the school.

The accommodation comprises a waiting hall, dental surgeon and doctor's room, minor ailment room, dressing and nurses' rooms, offices, stores and lavatories and w.c.s for staff and children. The walls of the waiting hall have been panelled in the same manner as the school assembly halls, and the remainder of the rooms have tiled dadoes. The floors generally are of compressed polished cork, with the exception of lavatories, etc., which are tiled. Externally the treatment of the building is in keeping with the remainder of the school. Heating is effected by means of "Rayrad" heating panels to all rooms, except lavatories, etc., which are heated by radiators.

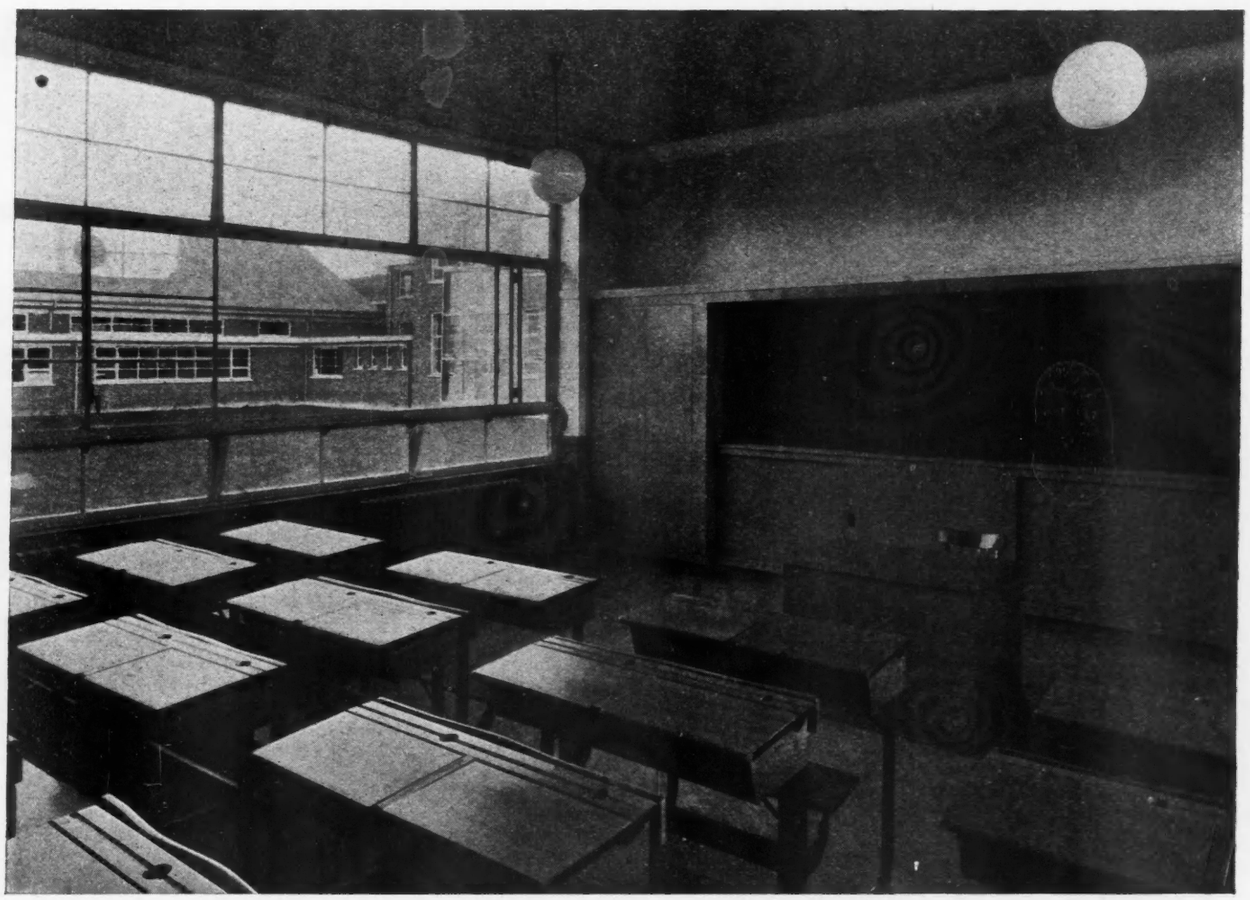
The contract price for the school was £59,743, and for the clinic £4,743. These costs include the whole of the work to the site, including the playgrounds and fencing, but exclusive of tree planting, drainage and preparation of playing fields.

The architect for the school and clinic is Mr. Frank Lee, L.R.I.B.A., Assoc.M.Inst.C.E., Surveyor to the Council, assisted by Mr. H. T. Townsend, A.R.I.B.A., and other members of his staff.

The quantity surveyors were Messrs. E. R. Babbs and Sons.

The contractors were Messrs. C. H. Chaston and Co., Ltd., of Holland-on-Sea, Clacton, Essex, and the work was completed in 16 months.

The sub-contractors and suppliers were: Permanite, Ltd., asphalt tanking and floors; T. W. Palmer and Co., W.I. railings, etc.; J. and R. Howie, Ltd., sanitary ware; Boulton and Paul, constructional steel; Everseal Products, flat roofing; Girlingstone, Ltd., art stone and reinforced concrete floors; Horsley, Smith, Ltd., woodblock flooring; Rowe Bros., metal windows; Z. D. Berry and Sons, heating and h.w. systems; Clarke and Vigilants Sprinklers, Ltd., fire hydrants; Cork Insulation Co., cork flooring; Tottenham Gas Co., gas installation; J. A. King, roof lights; R. C. Cutting, lightning conductors; Carter and Kernahan, floor and wall tiling; W. T. Lamb, roof tiling; Parker, Winder and Achurch, cloakroom fittings; Northmet Co., electrical installation; Pryke and Palmer, "Triplex" grates; Meadow Foundry Co., duct covers; J. Sadd and Sons, flush doors and panelling; W. N. Froy and Sons, ironmongery; Macfarlanes, r.w. heads; Garton and Thorne, aluminium shower frames; Turner's Asbestos Co., shower partitions; Harvey and Co., fume hoods; Pearsons, fibre mats; Rippers, Ltd., school furniture; Gardiners, gym. fittings; and E. H. Smith (London), facing bricks.

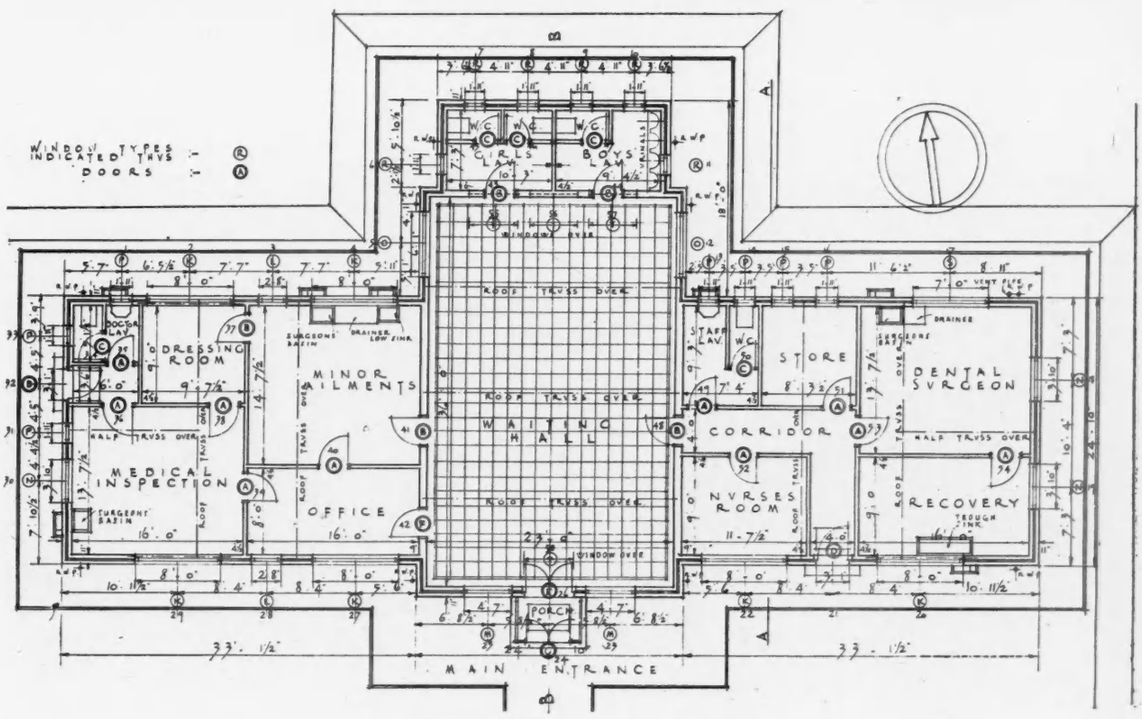


A CLASSROOM.

THE ALBANY SCHOOL AND CLINIC, FOR ENFIELD COUNCIL.

MR. FRANK LEE, L.R.I.B.A., SURVEYOR TO COUNCIL, ASSISTED BY MR. H. T. TOWNSEND, A.R.I.B.A.

THE CLINIC, SHOWING ENTRANCE FRONT.



PLAN OF CLINIC.

THE ALBANY SCHOOL AND CLINIC, FOR ENFIELD COUNCIL.

MR. FRANK LEE, L.R.I.B.A., SURVEYOR TO THE COUNCIL, ASSISTED BY MR. H. T. TOWNSEND, A.R.I.B.A.

NEW DEPARTMENTAL STORE, WELWYN GARDEN CITY.

MR. LOUIS DE SOISSONS, F.R.I.B.A., S.A.D.G., ARCHITECT.

THE new Welwyn Store, opened this week by Lord Harmsworth, is situated on the east corner of Parkway and Bridge-road, which at this point forms the southern boundary of the Campus, around which future public buildings of the Garden City will be built. The site covers an area of about three acres, and includes the Parkway frontage and main shop of the old stores adjoining the theatre.

The ground floor and part of the first floor accommodate the general departmental store, the housing of which is the main purpose of the building. At the west and east ends respectively of the main shopping area of the first floor are the Parkway restaurant and the Welwyn Garden City Limited general offices, both reached by separate stairs from the street and from the shopping area.

Above the first floor are flats built in blocks of varying height round the edge of the building. Access to these is by four staircases and two lifts from the street, which lead on to a flat roof over the main shop. The lower storey of flats is reached directly from the roof, and those above by staircases and, in some cases, access balconies. On the flat roof is also a sports club, in which are badminton and squash courts, billiards and card rooms, and a lounge and buffet.

The outside of the building is in keeping with the character of the rest of the Garden City. It is faced with local multi-coloured sand-faced bricks with artificial Portland stone dressings. The windows are wood double-hung sashes and casements, with wrot-iron balconies accentuating certain points of the façade. The roof is red tiles.

The principal entrance to the store is through a two-storey portico facing Bridge-road. The ground floor consists chiefly of a large open shopping space and, separated from this by glass doors and screens, a food hall, lit by artificial daylight, which, in conjunction with a green and white chequered terrazzo floor and tiled walls, looks cool and fresh. In the centre of the shopping space a double staircase in an open well leads up to the first floor. Here, also, is an open shopping space with enclosed departments, such as hairdressing, opening off it, and at one end a wide flight of steps leads up to the foyer of the Parkway restaurant. The restaurant is a long room, unobstructed by columns, with windows from floor to ceiling round three sides. The curtains and ceiling form the principal decoration; the former are cream-coloured linen printed with a special design in blue, grey and red. The ceiling is divided into deep square coffers with a circular mirror and glass light fitting in each. Additional light and decoration are provided by delicate, painted metal wall chandeliers.

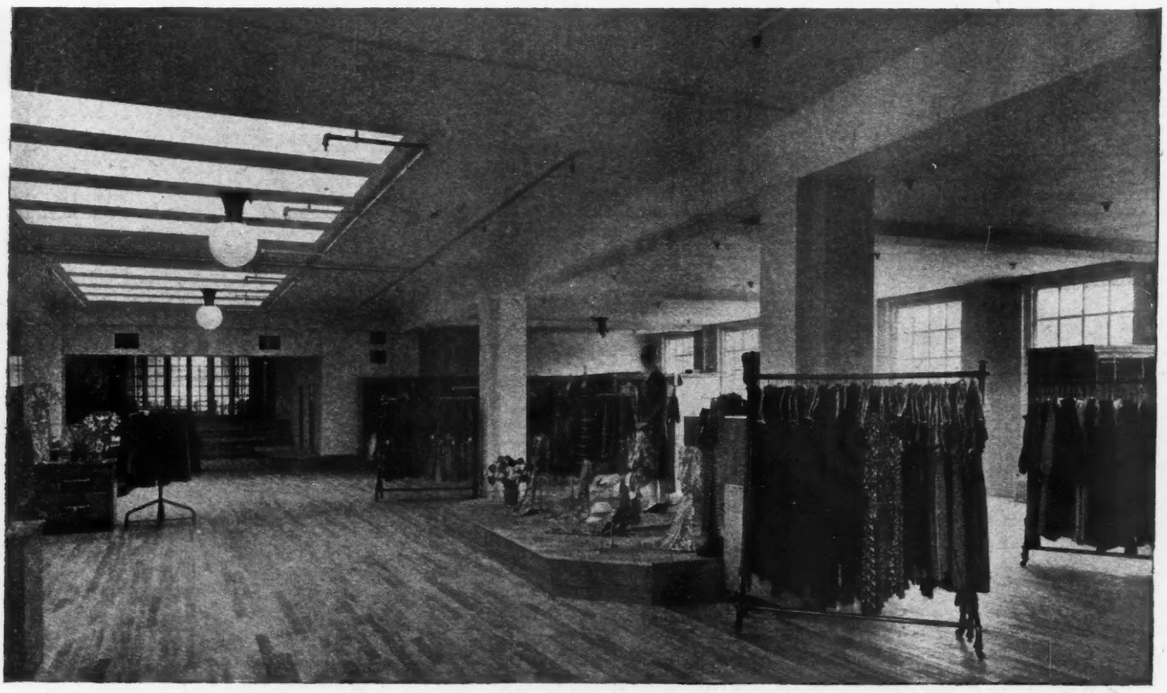
The interior of the store is simple and straightforward in character. Counters and similar fittings have been specially designed and are made of wax-polished oak. Details are plain, and shapes follow constructional lines.

The building consists of a steel frame with hollow tile floors throughout, with the exception of the roof over domestic flats, which is in timber. The stanchions in the shopping portion are necessarily spaced widely apart, and preliminary investigations of the framing revealed that the most economical scheme would consist of continuous main steel beams with long span hollow tile floors, spanning directly on to them without any secondary beams. This method of framing held a further advantage in that the depths of main beams could be materially reduced, giving increased head-room without any loss of economy. Special stanchion sections were devised to allow the main beams to run through them.

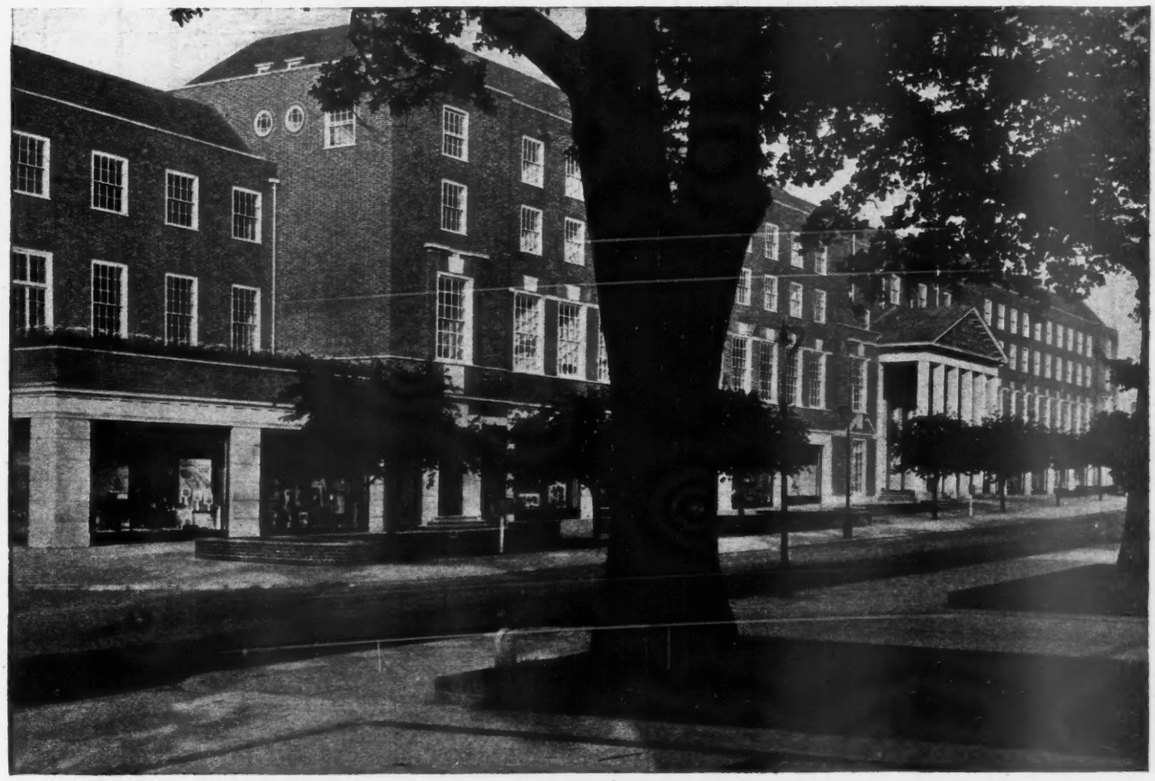
The foundations consist, for the most part, of mass concrete piers, which, in the case of the basement, are incorporated with the concrete retaining walls. In one or two cases the excavations showed "swallow-hole" patches of poor ground, and special foundations were devised to overcome these difficulties.

The architect is Mr. Louis de Soissons, F.R.I.B.A., S.A.D.G., M.T.P.I., and the general contractors Messrs. Welwyn Builders, Limited, Welwyn Garden City, under the control of the general manager, Mr. Forster. The general foreman was Mr. T. Heath, and the quantity surveyor S. A. Paine, F.S.I. Messrs. R. T. James and Partners acted as consulting engineers.

The following were the principal sub-contractors: Structural steelwork, Messrs. Dawnays, Ltd.; reinforced concrete floors, Attoc Blocks, Ltd.; roof tiling, Messrs. John Williams and Co.; asphalt roofs, Messrs. Frazzi, Ltd.; plumbing, Messrs. Matthew Hall and Co.; plastering, Messrs. E. Hawkins, Ltd.; glazing, Messrs. J. B. Robinson; heating and ventilation, Messrs. James Combe and Son; sprinkler installation, Messrs. Mather and Platt, Ltd.; electrical installation, Welwyn Garden City Electricity Supply Co., Ltd.; lifts, Evans Lifts, Ltd.; conveyors, Messrs. W. and C. Pantin, Ltd.; store-fitters, Messrs. Courtney Pope and Co., Ltd.; shop fronts and joinery, Welwyn Builders, Ltd.



A TYPICAL INTERIOR.

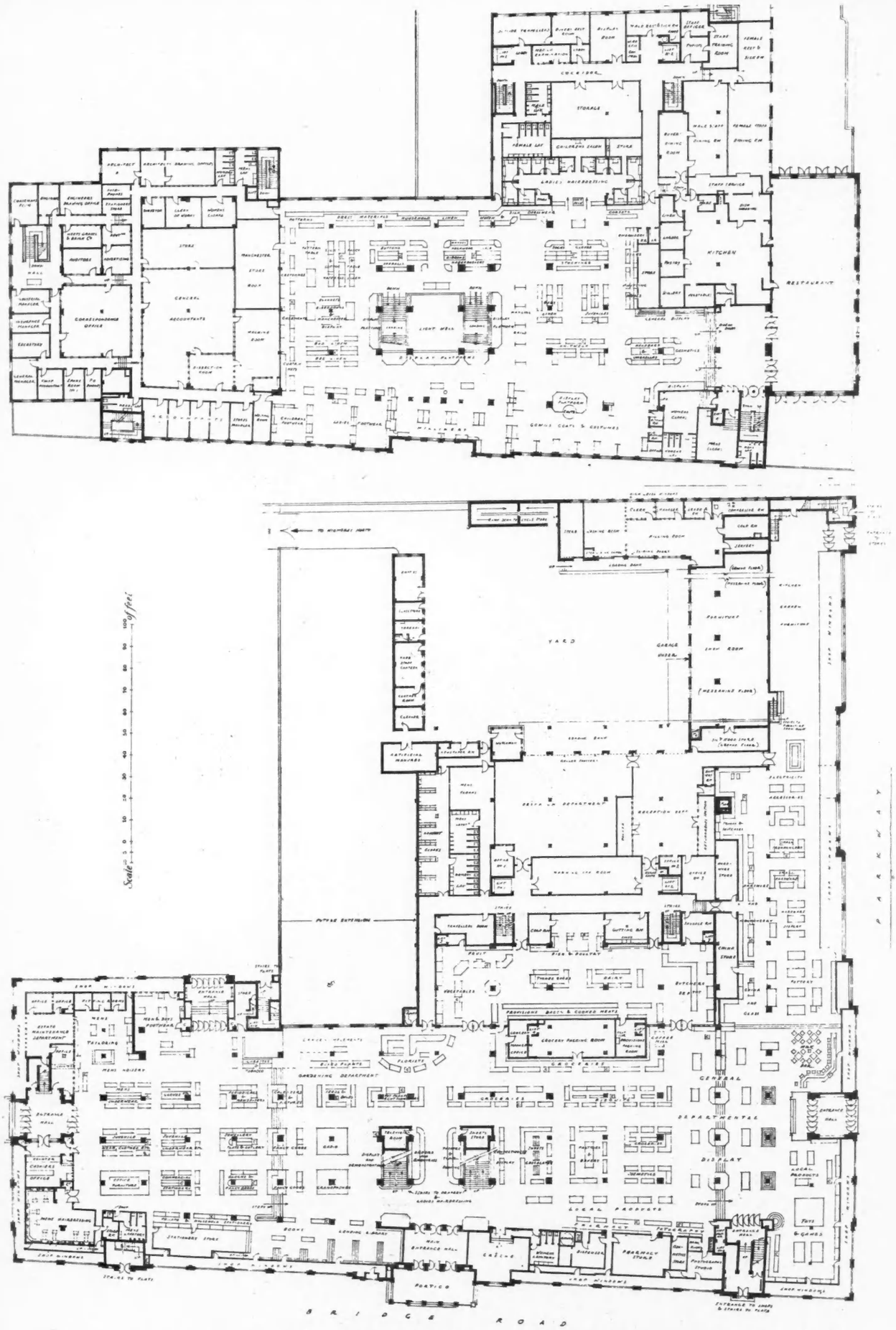


GENERAL VIEW OF BRIDGE ROAD FRONTAGE.

VIEW SHOWING RETURN TO WIGMORE NORTH.

NEW DEPARTMENTAL STORE, WELWYN GARDEN CITY.

MR. LOUIS DE SOISSONS, F.R.I.B.A., S.A.D.G., ARCHITECT.



NEW DEPARTMENTAL STORE, WELWYN GARDEN CITY: GROUND- AND FIRST-FLOOR PLANS.

MR. LOUIS DE SOISSONS, F.R.I.B.A., S.A.D.G., ARCHITECT.

BANKRUPTCY OF BUILDERS

(Continued from page 1218.)

I said earlier that bankruptcy is a risk common to all trades; but the path of the would-be bankrupt is possibly made broader in the building trade for the reasons shown in the following extract from the remarks of the Official Receiver on a voluntary liquidation:—

" . . . While the above-mentioned causes may have been contributory causes of the failure, the primary cause was mismanagement on the part of the directors in that they permitted the company with an issued and paid-up capital of only £516 to enter into contracts involving an expenditure of several thousands of pounds, with the result that the business of the company was largely carried on at the risk of the creditors, who were so ill-advised as to give credit to a building company with no real substance behind it. . . .

" . . . The whole history of this company is typical of the history of many of the building companies which have been ordered to be wound-up by the Court during the last two or three years; and as long as the suppliers of building materials are prepared to give practically unlimited credit to these small building companies with little or no financial stability behind them, so long, it would appear, will the present unsatisfactory state of affairs continue."

These remarks suggest that the remedy lies in our own hands. In fact, however, most sub-contractors have experience of the difficulties that attend them if they have to inform the architect of their reluctance to accept, without further guarantee, an order from his builder. It is natural that the architect should feel annoyance at the ensuing revision of his arrangements; unfortunately, it is equally natural that, in some cases, the memory of this annoyance should become linked in his mind with the sub-contractor who was the most unwilling cause of it, to the detriment of their future business relations.

H. E. Cater.

St. Paul's Crescent,
Camden Town, N.W.1.

To the Editor of *The Builder*.

Sir,—I have read with interest the several letters concerning Mr. Cecil Kahn's letter regarding "Bankruptcy of Builders." Will you allow me to set forth some of the suggestions made by the Faculty of Architects, of which I am a member of the Executive Council.

It has been suggested that though the 1931 R.I.B.A. Form of Contract provides sufficient cover for the sub-contractor and, together with the Standard Sub-contract Form, 1936, gives substantial support to the architect, it should be made "an offence" in law to allow a contractor to establish an overriding contract on sub-contractors; that all sub-contractors should supply to the architect the amount as given to the contractor, and that when a certificate is given the particular specialists or sub-contractors should have sub-certificates given, and that these amounts should be incorporated within the larger certificate of work performed. The sub-contractor is responsible to the architect, insofar as quality of work performed is concerned, and the specialists would be assured of payment.

This would reveal to the architect, who has to advise his clients, what class of "contractor" is giving a quotation—whether an "office contractor" only, who exists to suck the lifeblood out of specialists and sub-contractors, or an established building contractor, the pride of the business with, very often, long family traditions and honour at stake. The architect of to-day can, and should, insist that, now the profession is a closed one and registration represents keeping a clean code of conduct, the new forms of contract should be framed so as to cover the points mentioned, enforceable on architect, contractor, specialist and sub-contractor.

John Beswarick.

5, Upper-avenue, Eastbourne.

ADVISORY PANELS

R.I.B.A. MEMORANDUM.

The following memorandum, prepared by the Public Relations Committee of the R.I.B.A., has been approved recently by the Council. Copies are being sent to the Allied Societies and the Central Panels Committee for circulation to the Panels controlled by these bodies.

The system of Advisory Panels set up under the joint auspices of the R.I.B.A., the C.P.R.E., and the Institute of Builders has now been in operation for more than five years. Panels have been established in a large number of districts and, in general, are working satisfactorily and with good effect. They are primarily concerned with advising local authorities in their control of the "size, height, design and external appearance" of buildings under the Town and Country Planning Act, with the broad object of promoting good design and preventing the poor and unsightly building which has done so much in many places to spoil the appearance of both town and country.

It is not, of course, the function of an advisory panel to be an arbiter as between one architectural style and another, or to pronounce on matters of detail about which professional men are bound to hold widely varying views. The panel's function is essentially to prevent the erection of buildings, chiefly small houses, which would disfigure an urban background or country landscape. There is such a large field open for improvement of standards and for education of the speculative builder and the house-purchasing public as to afford ample scope for the operations of the panels without their being involved in controversies as between one school of architectural design and another. Indeed, it is believed that in the public interest and for the good of the profession such controversies are undesirable and may be actually harmful.

This being made clear, it should not, however, be assumed that a panel should feel precluded from expressing an opinion on plans submitted by architects as well as by builders, but only that in so doing they should be guided solely by the suitability or otherwise of the design for a particular site or locality. It would be a mistaken policy, which would certainly entail adverse comment, if the panel only reviewed plans submitted by builders.

Another point on which the panel should be clear is that it is not their function to redesign proposals submitted. They will give direction as to what amendments are necessary, illustrating these if need be by rough sketches, and if the design is so poor as to be incapable of amendment without fundamental alteration, then the panel's recommendation to the council should be that new plans should be submitted on the lines indicated. The planning officer or council official who communicates the council's decision to the submitter of the plans can often perform a useful service by suggesting to a builder that he should engage an architect to prepare proper plans for him that will be likely to satisfy the requirements of the panel—instead of merely re-submitting a slightly altered version of his own.

It is very desirable that, when a plan has been submitted by or bears the name of an architect and has been referred to a panel by the planning authority, any objection to or criticism of the design by the panel should, subject to the permission of the planning authority, be communicated to the architect concerned before the authority makes its formal decision. If this is done adjustments meeting the panel's criticism can often be agreed with a minimum of trouble and without any loss of time. In any case it is most important that the authority's decision should be communicated in the first instance to the architect rather than to the building owner or builder. Cases have arisen in which unfortunate repercussions have occurred from the panel's decision being communicated direct to the building owner without the architect's knowledge; indeed, in a particularly regrettable instance, without the architect being even aware that his plans would be perused by a panel. The Code of Professional Practice which is binding on members of the R.I.B.A. should always be borne in mind when members of the panel are concerned with the work of another architect.

Above everything, a broad-minded approach to design problems and the exercise of tact and good feeling are valuable assets in the successful operation of the panel. The method is an experimental one, and the conditions differ between districts. Bearing in mind, however, that the chief objective is the avoidance of slatternly and ignorant design of small buildings, the improvement in the standard of which can do so much to make town and country planning really effective, the architectural profession has a unique opportunity through the panels of rendering great service to the community.

THE A.A.S.T.A. & MILITIA MEMBERS

The following statement has been issued to members by the Council of the A.A.S.T.A.:—

At the June meeting of the Council of the Association it was resolved to remit the subscription of members while serving their period of training under the Military Training Act.

It will be remembered that the Council opposed the introduction of conscription for a number of reasons, including the removal at the time of architects from the Schedule of Reserved Occupations, the inadequacy of official air-raid precautions measures and the failure to make proper use of the services of architects in this connection, and the possible curtailment of the democratic rights of trade unions.

But conscription, with important safeguards, has now become a part of British law and the Council of the Association accepts it. It proposes no further action than that the Association should exercise its vigilance as a professional body to see that the best use is made of the abilities of its members, and to protect the interests of its junior members, who are, or will be, most directly affected.

The Council believes that all members of the Association are anxious to defend our democracy to the best of their ability, and they must be supported in this desire. The young men of the Militia must not feel that they are cut off from the profession, or that the Association has lost interest in them. By continuing their membership without subscription, by sending them "Keystone," by keeping open to them the activities and the benefits of membership, the Council will show that it sympathises with the ideals which they are training to defend.

If any of the younger members feel that they are suffering unreasonable hardship through wrongful dismissal, interruption of studies, or financial embarassment, they should communicate with the secretary, who will be glad to give advice and, if necessary, provide legal aid.

Meanwhile, other Association members are engaged on research and propaganda for properly planned air-raid shelters and evacuation measures. This work is no less essential for the safety of our country, and the Association will shortly be publishing proposals for a wide extension of it in all the provincial branches.

PRESTATYN HOLIDAY CAMP

ITS DESIGN AND CONSTRUCTION

THE Prestatyn Holiday Camp, North Wales, illustrations of which are given on pages 1209, 1210 and 1219-1224 of this issue, was opened on Thursday, June 22. Mr. William H. Hamlyn, F.R.I.B.A., architect to the London Midland and Scottish Railway, who designed the Camp, is the author of a paper on its design and construction.

Following are extracts from MR. HAMLYN'S paper :—

The Prestatyn Holiday Camp is probably the first large undertaking of this nature where the entire conception, both the planning, construction, decoration, furnishing, equipment and garden layout have been designed and controlled by an architect acting on behalf of the owners and enjoying their complete confidence in the development of the conception. It will be of interest to compare the result with those camps which have been put together piecemeal without professional guidance and to the taste of the owner, who has not had any training or experience to qualify him in the design of large building and engineering projects. There is abundant evidence that people of all classes in this country react to artistic surroundings, and therefore as much consideration and care have been devoted to the design of the Prestatyn Holiday Camp as have been applied to some of the most costly and important buildings erected by the Railway Company for its own purposes.

Garden Design.

The design of the garden has been kept as simple as possible in order to restrict the cost of maintenance. Trees of the cupressus family, allumi and pottenii, have been used in order to provide a foil to the light range of colour schemes and the flower colours in the courtyard. Bedding plants selected are those which will bloom for long periods, geraniums and dwarf dahlias, probably throughout the season. The remainder of the garden scheme consists of turf.

Chalets.

The most interesting form of construction is that adopted for the chalets. A good deal of research and experimental work was undertaken in order to arrive at the most economical form of construction consistent with attractive appearance, and weather-resisting and acoustical properties. The fundamental material in the chalets is "Wellinlith." This material is composed of specially prepared wood shavings, chemically impregnated, bound together with cement, and pressed into moulds to form slabs. The slabs weigh 25 lb. per cubic foot, and are easily handled, making for rapid erection. The material is used in slab form 2 in. thick.

The general construction of the chalets is as follows :—

On the site of each chalet a 4-in. concrete raft was laid, reinforced with No. 65 B.R.C. supplied by the makers in flat sheets to the size required. The concrete mix for the raft is four parts local limestone graded from 1½ in. to ½ in., one part of selected sand from the dunes on the site, and one part of pit sand to give the necessary sharpness, and one part of Portland cement. Concrete posts 6 in. by 6 in., having grooves 2½ in. by 1 in., were erected at the angles of chalets and at intermediate points, and at the top of each post is a dowel carried through a 6-in. by 3-in. timber plate to support the roof, the plate being braced at angles and intersections by a ¼-in. steel angle gusset screwed to the timber. The "Wellinlith" slabs are bedded in three-to-one cement mortar and carried into the grooves of the concrete posts. The roof construction is simple, 3-in. by 2-in. rafters being notched on to a central ridge to give the necesary fall without the use of fillets. The roof covering is of ¾-in. sawn boarding covered with two layers of "Ruberoid."

The plaster rendering to the "Wellinlith" is finished with the wood float, except behind the wash basins, where a panel is rendered smooth with the trowel to take enamel paint, and painted outside with "Keystone" concrete paint and inside with "Kaveco" water paint. Windows are rustproof steel standard sashes with horizontal bars. The disposal of rainwater from the chalet roofs is by means of 2-in. asbestos cement pipes with a copper swan neck at the top, iron or steel being avoided as far as possible to eliminate rust so prevalent in situations close to the sea.

Lavatory and Bathroom Blocks.

Lavatory blocks are built in the centre of each of the main courtyards, and are constructed on a concrete raft of similar design to the chalets. Walls are 4½-in. hard local bricks in cement mortar rendered with aquacrete inside and out. The roof is simply designed timber framing, the main portion being hipped and covered with tiles of a green colour to match the chalet roofs.

Main Buildings.

The two main buildings are similar in construction. Steel stanchions carrying longitudinal steel beams and cross beams support the roof trusses. These have been designed with exceptionally long spans and a low rise, and attention is directed to the dining-room, 186 ft. long and 96 ft. wide, with only two supporting columns placed on the longitudinal axis of the room.

The ceilings are worthy of note, and are formed of a special construction known as "And Wedge" method. The construction is as follows : On the bottom tees of the roof principles 3-in. by 2-in timber plates are bolted. 9-in. by 3-in. bearers are notched and spiked to these plates at 6-ft. centres. Light steel tees 1½ in. by ¾ in. made from pressed sheets are secured to the timber bearers at 2 ft. ⅜ in. centres by special hangers. Cross tees with a small piece of flange cut away at each end are laid across the longitudinal tees, the result being a series of trays in which Turner's asbestos ceiling boards, 6 ft. by 2 ft., are placed and secured in position by small wooden wedges driven through slots cut through the web of the steel tee and pressing the ceiling board tightly to the flange.

The walls of the main buildings are of two 4½-in. skins formed of hard local bricks and built to cover each side of the stanchions without leaving projections. Bonded brick ties are arranged at suitable intervals. Walls are plastered outside with aquacrete and inside with cement mortar finished with sirapite plaster. All the internal walls of the main buildings, with minor exceptions, are built of 4-in. "Wellinlith" slabs reinforced with B.R.C. fabric at the joints where the wall is of cavity form.

Steelwork Design.

The subsoil of the site is wet sand, and it was decided to adopt local practice for loading, namely, 1 ton per sq. ft. on the ground, and the concrete bases were accordingly distributed in order that the above load would not be exceeded. Concrete for the foundations is of the standard mix, 1 : 2 : 4, the bases being reinforced with steel rods of the necessary diameters. The steelwork is designed to the requirements of the Institute of Structural Engineers' Report, Second Edition, 1938, and the following are the weights in the various structures : The dining block, 180 tons; the reception block, 90 tons; the water tower, 25 tons; the observation tower, 18 tons.

In the main building, referred to as the dining block, the structure is comprised of rolled steel joists and channels, latticed girders and trusses, and covers an area of 60,000 sq. ft., which indicates an economic design of steel, namely 6.72 lb. per sq. ft.

Roads and Site Covering.

The whole of the roads were completed in nine weeks, and with the exception of Atlantic-drive, are of 4-in. thick concrete without reinforcement. Atlantic-drive, the main service road, is 6 in. thick reinforced with B.R.C. No. 9, and has an expansion joint down the centre. All roads have an expansion joint every 50 ft. Concrete was placed in one layer on concrete paper, and the surface left finished from the tamper. Steel road forms were used, and their rapid fixing into position, combined with the even rest for the tampers, considerably expedited the work.

Swimming Pool.

At first a serious setback was experienced in this section of the scheme. After considering the serious obstacle which the subsoil water presented, it was decided to raise the pool higher out of the ground, and instead of the walls of the pool remaining at 3 ft. above the ground, as originally designed, they were raised to 5 ft., thereby reducing considerably the excavations necessary. By means of an elaborate pumping system the water in the subsoil was pumped over the dunes into the sea, but pumping had to be continued day and night without a break. The excavations for the pool were accomplished by means of a dragline excavator, and as soon as the bottom was reached a 2-ft. thick layer of mass concrete was laid. On this layer the 9-in. reinforced concrete bottom of the pool was placed, a binding to the mass concrete being secured by stirrups tying the mass and reinforced floors together.

Decorating and Furnishing.

In considering the scheme of colour for the external decoration of the buildings, due regard was given to the extensive area covered by the structures of various kinds. It is apparent that unless the architectural design of the chalets, for instance, was considerably varied, a monotonous effect could easily result. In order to avoid monotony, it was decided to treat each courtyard as a separate colour scheme and to depend upon this colour value, combined with the garden layout, to retain variety and freshness throughout the entire scheme.

It was realised, however, that unity with the main buildings, having been attained in the architectural intention, must follow in the decoration. Therefore all the chalets and buildings facing towards the main centre are treated with a uniform scheme of colour which consists of ivory walls, bright green windows, and incidental details such as columns, door furniture, etc., in lacquer red. Lamp-posts throughout the camp for road lighting are of concrete, the lamp fittings being designed by the architect in the form of lanterns, the motif being specially considered as a field for colour effect, which is carried out in red, green and gold.

The internal decoration of the main buildings depends upon flat wall treatments in colour, combined with curtains specially designed by the architect, which form the basis for the colour scheme in each room. Relief effects around doorways, etc., are formed economically in cut-out block board, the only fibrous plaster enrichments being around stage prosceniums and the Britannia Bar counter recess. In addition to the bright notes provided in the curtain scheme, others are to be found in the electric fittings.

I desire to acknowledge the co-operation and assistance which has been given to me in the preparation of this paper; to Major G. D. MacAndrew, A.M.I.C.E., M.I.Struct.E., resident engineer in charge of the work for Messrs. McLaughlin and Harvey, Ltd., the general contractors, for his comprehensive report on the carrying out of the work on the site, together with many notes on constructional problems encountered during the progress of the work; to Mr. W. T. Streather, A.M.I.C.E., for his report on the drainage work and the sewage ejector; to Mr. Campbell, of the Chief Civil Engineer's Department of the London Midland and Scottish Railway, for his memorandum on the design of the structural steel framework for the various buildings; to Mr. S. P. Smith, M.I.Mar.E., of the London Midland and Scottish Railway Hotel Controller's Office, Engineer's Department, for notes on the kitchen equipment and lay-out; to Mr. J. F. Cooper, Dipl.Arch., A.R.I.B.A., of the London Midland and Scottish Railway Architect's Office, for his co-operation and assistance in preparing the drawings for exhibition and arranging for lantern slides.

NEGLIGENCE OF ARCHITECT AND ENGINEER—III

By W. T. CRESWELL, K.C., Hon. A.R.I.B.A., A.S.I., etc., assisted by NORMAN P. GREIG, B.A., Barrister-at-Law.

ATTENTION has been frequently called to the necessity for an architect or engineer to a building or engineering contract to be familiar with local by-laws and requirements of statutes which will affect the buildings to be erected or works to be executed, and that, in the exercise of his professional duties towards his employer, he should advise the latter upon these points when the contract itself is being drawn up.

Nuisance.

Closely related to this function of the architect and engineer is the desirability of being acquainted to some extent with the law regarding "nuisance," for it is conceivable that, through ignorance on the architect's or engineer's part, an employer, for example, who has erected a new building might eventually discover that the presence of a nuisance might considerably affect his amenities.

It is a well-known legal principle that, speaking broadly, one should not "go to a nuisance," for if one does do so, one might find oneself powerless to take any legal steps to abate it, or even to have it abated. The position, however, is different where a nuisance comes to one, for in such a case the procedure required by common law or statute could be put in force to deal with it. As an example, the erection of a building such as a dwelling-house in close proximity to a sewage farm or a factory in which objectionable trade processes are carried out involving the discharge of noxious or unpleasant fumes, would place no responsibility upon anyone but those who had conceived and carried out the project; while, to a somewhat less extent perhaps, the presence of machinery inducing vibration might considerably affect the stability of a building.

It is not suggested as a general principle that the full responsibility for such a happening is, or should be, thrust upon an architect or engineer, but it is suggested that he should, through his knowledge of the general law concerning nuisance, be in a position to give, and should rightly give, advice to a person who employs him in a building or engineering project.

Again, as is well known, the erection of modern buildings, particularly now that steel construction has become so popular, often involves the contractor in trouble because of the nuisance caused to inhabitants in the neighbourhood due to the methods employed in this particular kind of erection. An architect or engineer should, then, when the contract is in course of preparation, be in a position to advise the employer or the contractor as to the possible consequences of using a certain type of construction or even to suggest a particular form in which any nuisance or inconvenience to dwellers in the neighbourhood could be reduced to a minimum or avoided altogether. It is true that the Courts have laid down a general principle that they will not interfere with noisy building and engineering operations or works in course of erection, provided that such work be performed at reasonable hours, but it has been held that pile-driving by night, by which the inhabitants of adjoining houses were prevented from sleeping, was neither right nor reasonable. See De Keyser's Royal Hotel, Ltd., *v.* Spicer Bros., Ltd., and Winter (1914), 30 T.L.R. 257.

It is understood that the London County Council and the Metropolitan Borough Councils Standing Committee are considering the introduction of legislation that will have the effect of regulating, during the night, noise from business premises, and such might very well cover the noise of pneumatic drills during the course of operations, particularly, on highways. Should this proposal materialise, the present procedure of applying for an injunction to restrain such a nuisance, always a costly action, will be replaced by a simpler method of dealing, probably in a court of summary jurisdiction, with a statutory offence, and the list of statutory nuisances, such as those contained in the Public Health Act, 1936, will be considerably increased.

It is difficult to define "nuisance." In Halsbury's "Laws of England," one class of nuisances suggested is, "acts not warranted by law or omissions to discharge a legal duty, which acts or omissions obstruct or cause inconvenience or damage to the public in the exercise of rights common to all His Majesty's subjects." This form of nuisance is what is known as a public nuisance, though even such may affect some persons to a greater extent than others among those who are affected by its operation. A private nuisance, on the other hand, is one affecting only those who are immediately within the sphere of operation. The distinction between a public and private nuisance is of considerable importance as affects the remedies applicable to each. It should be mentioned, however, that no right of action exists for a private individual in respect of a public nuisance, unless he can show that he has sustained some special damage beyond that which has been suffered by the community in general. It should also be pointed out that it is possible to acquire a right to commit a private nuisance by prescription—that is, by exercising it for a certain space of time, but no such right by prescription can be acquired in the case of a public nuisance.

On statutory nuisances it is not necessary to enlarge, particularly as these cover a number of acts concerning matters beyond the present scope. The Public Health Act, 1936, for example, contains, in Section 92, a list of statutory nuisances under that Act, which can be dealt with summarily.

Regarding the nuisance of noise, against which proceedings would be taken by injunction, and which would be granted in a proper case, such is one (including vibration) which materially interferes with the comfort and health of inhabitants in the neighbourhood. It affords no excuse to plead that it is made in a noisy neighbourhood if it can be proved that this particular noise (or vibration) is one which is an addition to those noises already there. Neither will the fact that it is pleaded that the best means of preventing or reducing it have been used, if, in fact, it exists. It is a matter of degree as to whether a nuisance exists or not, depending entirely upon the particular circumstances of the case.

In general, the Court will grant an injunction to restrain a nuisance where it is resulting in substantial injury or, where the injury is slight, the nuisance is a continuing one. It may do so, also, in a case where a defendant claims a right to continue his action, or even where he makes a threat to do so.

Negligence: General Considerations.

Summarising, then, the architect or engineer, by holding himself out to practise, represents that he possesses, to a reasonable extent, the skill, ability and experience his profession demands, as well, to a large extent, as the particular knowledge associated with the carrying out of projects included among his professional duties. He is liable if he neglects the necessary degree of care he professes, and the degree of care he should use is that used by others in the same profession. He is not liable for errors of judgment, nor from any want of skill while performing some act inappropriate of performance by members of his particular profession. It is a person's duty to know whether he is fitted for some work of skill, and he should not undertake it if he is not.

The liability of an architect or engineer for negligence ends, under the Statutes of Limitation, at the end of six years from the act of negligence, even though damage has not accrued. Where there is fraud, the Statutes run from the date when the person injured discovered the fraud, or with reasonable diligence ought to have discovered it. Concealed fraud and absence of reasonable means of discovery will always prevent the application of the Statute. See Gibbs *v.* Guild (1882), 9 Q.B.D. 59, and Legh *v.* Legh (1930), 143 L.T. 151.

(*Concluded.*)

R.I.B.A.

Membership.

At a Council meeting of the Royal Institute of British Architects held on Monday, June 19, the following members were elected :—

AS FELLOWS.

R. Anderton (Blackpool).
K. E. Black (Brighton).
Col. L. C. Brewill, T.D. (Nottingham).
R. Cawkwell (Sheffield).
E. H. Edleston (Nantwich, Cheshire).
C. Green, M.A. Oxon. (London).
W. A. S. Lloyd, M.A. (London).
H. M. Luyken (South Benfleet, Essex).
S. W. Mobbs (Norwich).
W. Sadler (London).
R. B. J. Selby, A.A.Dip. (London).
C. G. Skinner (Bristol).
T. A. Skinner (Bristol).
T. R. Somerford (London).
S. G. Soper (London).
T. A. Swan (Edinburgh).
J. G. Bennett (Gravesend Kent).
C. Bond, A.M.T.P.I. (Chesterfield, Derbyshire).
G. H. Griffiths, A.M.T.P.I. (Cardiff).
Sir W. F. V. M. Milner, M.A. (Oxon.), F.S.A. (London).
H. R. Ross (London).
T. F. Trower (Spalding).
F. E. Wapshott, F.S.I. (Maidenhead, Berks.).

Overseas.

G. H. Crickmay (Springs Transvaal).
E. E. Temple (Ottawa, Canada).
L. G. Jackson (Nairobi, Kenya Colony).

AS ASSOCIATES.

J. E. Beardshaw (Sch. of Arch., Victoria Univ., Mancr.), (London).
J. R. Beaton, Dip. Arch. Abdn. (Aberdeen Sch. of Arch., Robert Gordon's Tech. Coll.), (Glasgow).
A. M. Foyle (Bartlett Sch. of Arch., Univ. of London), (London).
F. J. Hartnell-Beavis (A.A.), (London).
A. McK. Hunter, Dip. Arch. Edin. (Sch. of Arch., Edin. Coll. of Art), (London).
P. H. Lewis (A.A.), (Woking).
H. S. Mark (Glasgow Sch. of Arch.), (Ayr).
J. E. Martin (Aberdeen Sch. of Arch., Robert Gordon's Tech. Coll.), (Aberdeen).
D. B. Owen, Dip. Arch. Cardiff (Welsh Sch. of Arch., The Tech. Coll., Cardiff), (Newport, Mon.).
G. Pickup, Dip. Arch., Dip. T.P. (Mancr.), (Sch. of Arch., Victoria Univ., Mancr.), (Sheffield).
T. K. Scott, Dip. Arch. Mancr. (Sch. of Arch., Victoria Univ., Mancr.), (Oldham).
E. F. Tew (Glasgow Sch. of Arch.), (Blackburn, Lancs.).
R. R. Tomalin (A.A.), (Sanderstead, Surrey).
J. Tomlinson, Dip. Arch., Lvrpl. (Lvrpl. Sch. of Arch., Univ. of Lvrpl.), Beckenham, Kent.)
F. C. Williams (Sch. of Arch., Victoria Univ., Mancr.), (Southport).

Overseas.

W. W. Darroll, Dip. Arch. (Cape Town, S. Africa).
Maj. H. H. Grant (Durban),
R. F. Horwood, B.Arch. (Lvrpl. Sch. of Arch., Univ. of Lvrpl.), (St. John's, Newfoundland).
W. H. A. Linington (Cape Town, S. Africa).
H. D. S. McGowan (Sch. of Arch., Univ. Coll., Auckland, N.Z.), (Auckland).
J. L. Mair, B.Arch. N.Z. (Sch. of Arch., Univ. Coll., Auckland, N.Z.), (Wellington, N.Z.).
M. M. Maitra (Calcutta, India).
G. W. Rennie (Cape Town, S. Africa).
W. R. Simpson (Sch. of Arch., Univ. Coll., Auckland, N.Z.), (Auckland, N.Z.).
P. M. Thornton (A.A.), (Vancouver, British Columbia).

AS LICENTIATES.

A. S. Gray (London).
D. Harvey (London).
F. N. W. Henzell-Ascroft (London).
E. G. V. Hives (Reading).
E. W. Palmer (Enfield).

Results of Tenders.

The Works Sub-Committee of the Metropolitan Boroughs Standing Joint Committee have issued to the Metropolitan boroughs the following report and recommendation adopted by the Standing Joint Committee at their meeting on May 1, 1939: (*a*) We have considered a letter, dated April 3, 1939, from the London Chamber of Commerce, pointing out that firms in the building trade in tendering for contracts have to spend much time and money, often without benefit to themselves. As the client has had this assistance from the tenderer he should be willing to render a service in return, and it is felt that he can do this by supplying all tenderers with a list of those tendering together with the amounts quoted, as it is of particular interest to a builder to see by how much a tender has been lost so that he can adjust his price when submitting estimates in future. It is understood that this practice is already followed by the London County Council. The committee are accordingly asked to bring this recommendation to the notice of their constituent councils in the hope that they may see their way to adopt the suggestion. (*b*) We are of the opinion that this matter is one for the discretion of the individual councils concerned.

IN PARLIAMENT

Building Societies' Profits.

MR. ELLIS SMITH asked the Secretary to the Treasury if he could state the total profits of building societies in Great Britain for the years 1930, 1934 and 1938; and whether he could now take steps to reduce the 4½ per cent. that was charged by building societies.

CAPTAIN CROOKSHANK said that as regarded the latter part of the question, it would be appreciated that the rate of interest charged by building societies was a matter for determination by the societies themselves. The estimated profits of building societies in Great Britain (in the sense of the interest paid on shares plus the additions to profit and reserve) were as follows :—

	1930.	1934	1938.
Interest on Shares	£12,852,000	£15,592,000	£17,981,000
Additions to Profit and Reserve ...	£1,914,000	£3,164,000	£3,537,000
	£14,766,000	£18,756,000	£21,518,000

Scottish Timber and Concrete Houses.

MR. T. HENDERSON asked the Secretary of State for Scotland if he could state the average cost of four-roomed timber and poured-concrete houses, respectively, for which State subsidy was paid; and the average cost of a four-roomed brick-built house also under subsidised conditions.

MR. WEDDERBURN said that the average cost of four-roomed houses of timber, poured concrete and brick construction approved for subsidy purposes during the twelve months ended May 31, 1939, was £458, £515 and £466 respectively. Sufficient experience had not yet been gained of timber and poured-concrete construction to enable a reliable comparison between the cost of building by those methods and the cost of building by the normal methods. With a more extensive use of alternative methods it might be expected that the cost of building by those methods would be reduced.

MR. T. HENDERSON asked what number of timber and poured-concrete working-class houses, for which State subsidy was paid, had been erected in Scotland by local authorities or development councils during the period from April, 1938, to April, 1939, and plans approved of, and estimates accepted, since April, 1939.

MR. WEDDERBURN said that during the year to April 30, 1939, 218 timber houses and 50 poured-concrete houses were completed under subsidy schemes. There were also at that date 1,720 timber and 1,082 poured-concrete houses under construction, while tenders had been approved by the Department of Health for 569 timber and 2,764 poured-concrete houses the construction of which had not begun. Since April 30 last the Department of Health had approved tenders for 886 timber houses, and plans for 1,030 poured-concrete houses not yet tendered for.

Banqueting Hall, Whitehall.

SIR R. GLYN asked the First Commissioner of Works if he could now state how far the negotiations had proceeded for the transfer to his Department's charge of the banqueting hall in Whitehall, now on lease to the Royal United Service Institution as a museum; and if arrangements had been made to provide in the building to occupy the Montague House and Whitehall Gardens site suitable alternative accommodation, thus taking advantage of the present opportunity of restoring for public use a building of exceptional merit.

MR. RAMSBOTHAM said the possibility of obtaining the use of the Banqueting Hall, Whitehall, and the adjacent property for Government purposes had certainly been under consideration in the past, but no concrete scheme had yet been prepared and no negotiations had taken place with the Royal United Service Institution, or were at the moment in prospect, as to the terms upon which they might give up possession of the premises in question. It would not be possible to accommodate the Institution in the new building to occupy the Whitehall Gardens site, as it would be wholly required for Government staffs.

Old Westminster Hospital.

MR. KEELING asked the First Commissioner of Works whether he would submit to the Royal Fine Art Commission the elevations for the proposed new office block on the site of the old Westminster Hospital facing the Abbey.

MR. RAMSBOTHAM said that the elevations for the proposed new office block on the site of the old Westminster Hospital facing the Abbey had been submitted to the Royal Fine Art Commission, who were at present considering them.

Clearance Orders.

SIR R. GLYN asked the Minister of Health whether he would consider the difficulties that arose in the case of a well-built building, sometimes of artistic merit, which had been the subject of a clearance order, as distinct from a demolition order, passed by the inspector and approved by the Minister, when, subsequently, it had been found that the building could be put to good use for other purposes, but it was impossible to raise money to demolish and then rebuild a structure not required as a dwelling; and if he would take powers to reconsider cases which the local authority and owner submitted to the Ministry for the reconstruction of the place after the clearance order had been issued.

MR. ELLIOT said that the existing law afforded to the owner of property included in a clearance order full opportunity for the making of representations that the property should be excluded from the order, and he gave careful consideration to such representations, including any proposals submitted for reconditioning, before arriving at his decision on the order. Special provision for the protection of buildings of artistic interest was contained in Section 142 of the Housing Act, 1936. In the circumstances he was not satisfied of the need for the introduction of the amending legislation which the suggestion of his hon. friend would involve.

King George V Memorial.

On the motion of MR. CHAMBERLAIN, the House of Commons approved the proposal of the Government "to devote to the purposes of the National Memorial to His late Majesty King George the Fifth certain property in the City of Westminster now vested in the Commissioners of His Majesty's Works and Public Buildings, namely, part of the site now occupied by Number 5, Old Palace-yard, and the sites formerly occupied by Numbers 1, 2, 3 and 4, Old Palace-yard, and by Numbers 1, 2, 3 and 3a, Poets' Corner, to the intent that the land comprised therein should form an open space surrounding a statue of His late Majesty King George the Fifth.

INQUIRY BUREAU

ANSWERS.

Bleaching Mahogany.

[ANSWERS TO "G. K.," JUNE 23.]

SIR,—Bleaching mahogany can be done by using oxalic acid crystals diluted with water. The strength can be gauged by the amount of water added, but there is a first-class material on the market for bleaching all woods. It is rather expensive but is certainly very effective. G. W. H.

[The name of the material referred to will be forwarded on request.—ED.]

SIR,—A very good bleaching solution for mahogany can be made by dissolving 1½ oz. of oxalic acid crystals in one pint of lukewarm water. This can be applied with a suitable brush or with a rag mop made on a piece of lathwood so as to keep it clear of the fingers. As this bleaching solution is poisonous, great care should be taken when using it. After bleaching the mahogany with oxalic acid solution, the surfaces should be well washed down with either water or methylated spirit to remove the oxalates of salts which have been deposited in the pores of the timber by the application of the acid. The use of methylated spirit will not raise the grain as much as a water wash would do, but, of course, the spirit treatment is the more expensive process.

An alternative bleaching solution can be made with one ounce each of oxalic and tartaric acids. If oxalic or tartaric acids have been used for bleaching the mahogany, well wash off with benzine. A. J. T. E.

Insulation.

[ANSWER TO "QUERIST," JUNE 23.]

SIR,—Relative properties of good wall-board skimmed with plaster and ordinary two-coat plaster work on brick walls :—

THERMAL CONDUCTIVITY.

C = Thermal conductance = B.T.U. per hour per square foot per 1 deg. F. temperature difference between surfaces.

U = Air to air transmission coefficient = B.T.U. per hour per square foot per 1 deg. F. difference in air temperature. Still air assumed.

4½-in. bricks and two coats of plaster each side.

C = 0.54 to 0.89.
U = 0.33 to 0.43.

Double wall of ⅜-in. good quality wallboard on 2-in. battens, two coats of plaster on each outside face.

C = 0.45.
U = 0.25.

SOUND TRANSMISSION.

4½-in. brick plastered as above. Sound-reduction factor = 54 decibels.

Double wall of ⅜-in. good quality wallboard, plastered as above. Sound-reduction factor = 56 decibels.

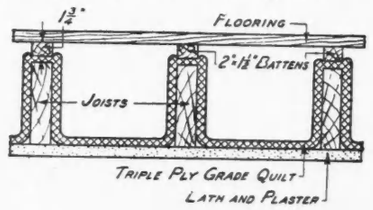
The results will entirely depend on care taken in workmanship. G. W. H.

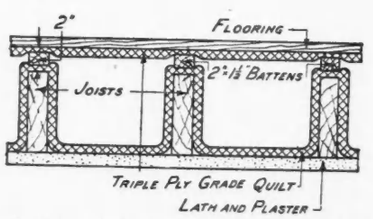
Sound Deadening Timber Floors.

[ANSWERS TO "E. C. B.," JUNE 23.]

SIR,—With floors already constructed an efficient method of sound insulation is to place strip rubber on the floor boards and put a wood layer on top to take any wear. Similar results can be obtained by taking up the floor boards, laying sheet rubber on the joists and laying the floor boards again. Sheet rubber is an efficient sound insulator, but wears if not protected, and this reduces its efficiency. W. E. W.

SIR,—Your correspondent could secure sound deadening or quietening of timber floors in flats by the proper use of any one of the special sound absorption materials available. "Suspended ceilings" in these materials are sometimes used for maximum effectiveness, and, when properly designed, absorb the sound waves and abate noise by their diaphragmatic damping action, but they are rather expensive. I have obtained very satisfactory results by simply nailing a comparatively thin sound-absorbing material to





the bottom of the floor joists, then plastering it, and at the same time have run hair felt under the floorboards, thereby securing a cushion to take up the structure-borne sound. Alternatively, I find that a good hair felt inserted over the whole area of the floor between boards and joists is preferable to any filling in between joists. The sketches herewith illustrate simple and effective methods of sound-deadening timber floors in flats.

I would also advise your correspondent to write to the various firms specialising in sound-deadening materials for data sheets and illustrated literature. A. J. T. E.

NEW BUILDINGS IN LONDON

The Editor welcomes authentic information for this feature from architects, surveyors or contractors. Where business representatives cannot be seen personally at this stage, this should be mentioned. Items should reach 4, Catherine-street, Aldwych, W.C.2, not later than Wednesday morning.

ACTON. — FACTORY. — Messrs. Hillier, Parker, May and Rowden, 27, Maddox-street, W.1, have had plans passed for a factory in Brunel-road, for the Continental Laboratories, Ltd. The building contract has been placed with Messrs. J. Lawson and Son, Ltd.

ACTON.—ADDITIONS.—Mr. L. G. Ekins, F.R.I.B.A., 99, Leman-street, E.1, is the architect to the Co-operative Wholesale Society, Ltd., who are to make additions to their premises at The Steyne. No contracts placed.

ACTON. — PREMISES. — Messrs. Mayell, Lockton and Ellerton, F. and AA.R.I.B.A., 173, Holland Park-avenue, W.11, are the architects for alterations and additions to 34-40, Osborne-road for Mr. D. Assersohn. No contracts placed.

ADDINGTON. — HOUSES. — The First National Housing Trust, Ltd., 10, The Boltons, London, S.W.10, are to erect 139 houses and 22 garages, in Queen Elizabeth's-drive. The plans have been approved by the Croydon T.C. The company's architect is Mr. H. Scroxton.

BARKING.—ALTERATIONS.—The E.C. are inviting tenders for alterations to Westbury school, Barking. The Borough Architect, Mr. C. C. Shaw, B.Arch. (Liverpool), A.R.I.B.A., has prepared the plans.

BECKENHAM. — EXTENSIONS. — Messrs. Pitchers, Ltd., 57, Ashburton-grove, Holloway, N.7, are the contractors for extensions to factory premises in Croydon-road, Elmers End. Messrs. Mitchell and Bridgwater, 42, Bruton-place, W.1, are the architects, and Messrs. Gleeds, 106, Regent-street, W.1, the quantity surveyors.

BEDDINGTON. — SCHOOL. — The Surrey E.C. has accepted the tender of Messrs. Downs Estates, Ltd., Brighton-road, Banstead at £14,162, for a new central mixed school at Bandon-hill. The architects are Messrs. Jarvis and Richards, FF.R.I.B.A., 1, Sedding-street, Sloane-square, S.W.1.

BERKELEY-SQUARE. — OFFICES. — The architects for the new offices to be erected on the site of No. 38, are Messrs. Howard and Souster, 81, Piccadilly, W.1. The building contractors are Messrs. Harry Neal, Ltd., 117, Baker-street, W.1.

BERMONDSEY. — PREMISES. — Messrs. Charrington and Co., Ltd., brewers, are proposing to re-erect the "Lion" beer-house at the corner of Rouel-road and Spa-road. Mr. S. C. Clark, F.R.I.B.A., 86, Fenchurch-street, E.C.3, is the architect.

BERMONDSEY. — SHOPS, ETC. — Messrs. Purvis and Purvis, 417, New Cross-road, S.E.14, are the architects for the Allied Interests Estates Co., Ltd., 417, New Cross-road, for shops with living accommodation and warehouse at 24-34, Tower Bridge-road, and 57-67, Leroy-street. No contracts placed.

BERMONDSEY. — PREMISES. — Messrs. Stewart and Hendry, FF.R.I.B.A., 90, Fenchurch-street, E.C.3, are the architects for the rebuilding of the "Red Lion" public house in Paradise-street.

BERMONDSEY.—FLATS.—The B.C. recommend that the sketch plans for 28 flats on the Maze Pond area be approved, and the estimate of the General Manager of £12,872 accepted; also the sketch plans for 103 flats and six shops on the Staples Rents Areas Nos. 1, 2, 3 and 4, and the General Manager estimate of £60,828.

BERMONDSEY.—FACTORY.—Mr. Laurence Kennard, 14, Railway-approach, London Bridge, S.E.1 is the architect for extension to the factory and air raid shelter to 77-91, Grange-walk S.E. No contracts placed.

BERMONDSEY. — PREMISES. — Messrs. Courage and Co., Ltd., Brewers, Horsleydown, S.E.1, are proposing to re-erect the "Windsor Castle" public house, Enid-street, on a new site. Mr. F. M. Kirby, F.R.I.B.A., is the company's architect.

BLOOMSBURY. — OFFICES. — A block of offices, to be called Russell-square House, is to be built on the site of 10, 11 and 12, Russell-square, with a frontage to Woburn-place, W.C.1, for Imperial Hotels, Ltd., Russell-square, W.C.1. Plans have been prepared by Messrs. Richardson and Gill, FF.R.I.B.A., 41, Russell-square, W.C.1. Messrs. Mullen and Lumsden, Ltd., 41, Eagle-street, W.C.1, have secured the contract.

BOW.—DRILL HALL.—Rebuilding and enlargement of the drill hall and headquarters of the 17th Batt. London Regiment (Tower Hamlet Rifles) is proposed by the County of London Territorial Army and Air Force Association, Duke of York's Headquarters, King's-road, S.W.3. The architect is Mr. Sidney W. Neighbour, L.R.I.B.A., 26, Bloomsbury-way, W.C.1. The quantity surveyors are Messrs. Northcroft, Neighbour and Nicholson, 26, Bloomsbury-way, W.C.1. The building contract has been placed with Messrs. Walker (Tooting), Ltd., Cadnam House, Beddington-lane, Croydon, at £22,488.

BROMLEY. — PREMISES. — Licensed premises at 146, High-street are proposed to be rebuilt by Messrs. Henekeys, Ltd., 22, High Holborn, W.C.1. The architect is Mr. Ernest R. Barrow, F.R.I.B.A., Lennox House, Norfolk-street, W.C.2.

CAMBERWELL. — RECONSTRUCTION. — Of the "Ossory Arms" public-house, Ossory-road, S.E., is contemplated by Messrs. Watney, Combe, Reid and Co., Ltd., Stag Brewery, S.E.1. The brewery architect is Mr. A. W. Blomfield, F.R.I.B.A. No contracts let.

CROYDON.—SCHOOLS.—The E.C. recommend a school for senior and junior children on the central site of the First National Housing Trust estate. The E.C. recommend tenders at £12,458 for alterations and additions to the Davidson School; at £16,460 for new junior department and alterations at Elmwood School; at £1,533 for extensions at Rockmount School, and at £23,462 for alterations and additions to Portland School.

CROYDON. — SHOWROOMS. — Are to be erected at 34, South End, by the Provident Clothing and Supply Co., Ltd., Bradford. The architect is Mr. George T. Harman, A.R.I.B.A., 90A, High-street, Lewisham, S.E.13, and the building contract has been placed with Messrs. James Watt (Catford), Ltd., 1, Central-parade, S.E.6.

CROYDON.—OFFICES.—The C.B. has passed plans for Mrs. E. Cheesman, 41, Croydon-road, Penge, S.E., for garage, offices, etc., at 37-43, Lower Church-street.

CROYDON.—BANK.—Mr. J. Reeve Young, 37, Gower-street, Bedford-square, W.C.1, is the architect for alterations to 46, High-street, for the District Bank, Ltd. No contracts placed.

CROYDON.—EXTENSIONS.—Messrs. E. A. Roome and Co., Ltd., 7, Urswick-road, Hackney, E.9, are carrying out extensions to the engine repair shops at Croydon Air Port. The architect is Mr. A. Lakeman, L.R.I.B.A., Architects' Dept., Imperial Airways, Ltd., 1, Eccleston-court, Gillingham-street, S.W.1, and quantities are by Mr. F. W. H. French, of the same address.

DAGENHAM.—EXTENSIONS.—To cost about £10,000, are to be made to York House, Frizland-lane, for the Dagenham District Nursing Association. The contractors are Messrs. Hammond and Miles, Ltd., Scrafton-road Works, Ilford. The architect is Mr. James A. Minty, F.R.I.B.A., 93, Park-lane, W.1. The quantity surveyors are Messrs. Waggett and Bradford, 25, Victoria-street, S.W.1.

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DARTFORD.—FACTORY.—Mr. A. Feakes, of Messrs. E. P. Feakes and Sons, London-road, Crayford, has prepared plans for factory building on land adjoining Salisbury-road and Princes-road. No contracts placed.

DULWICH. — BUTTERY. — Additions, including a new buttery, etc., are to be made to Dulwich College. Plans have been prepared by Mr. F. Austin Vernon, F.R.I.B.A., 22A, Cavendish-square, W.1, and the builders are Messrs. W. J. Mitchell and Son, Ltd., 88, Dulwich Village, S.E.21.

EALING. — LICENSED PREMISES. — The "Greystoke," public-house, in Queens-drive, is to be rebuilt for Messrs. Courage and Co., Anchor Brewery, Horselydown, S.E. The plans are by the company's architect, Mr. F. M. Kirby, F.R.I.B.A. The contractors are Messrs. A. E. A. Prowting, Ltd., 127, High-street, Ruislip.

EALING.—SHOP.—Messrs. Alfred Savill and Sons, 51a, Lincoln's Inn-fields, W.C.2, are the architects for a shop with offices over at 16, High-street, for Mr. G. Johnson. No contracts placed.

EALING.—BUILDINGS.—The T.C. has given permission to Messrs. Allnatt, Ltd., Chase Estate, Park Royal-road, N.W.10, to develop the land in Long-drive as an industrial estate.

EAST BARNET.—SCHOOL.—The Herts E.C. has accepted the tender of Messrs. Janes Ltd., of Luton, for a new infants' and junior mixed school for 400 places in Church Hill-road. The architects are Messrs. Dawe and Carter, F. and A.R.I.B.A., 83, High-street, Watford, and the quantity surveyors are Messrs. Gardiner and Theobald, 96, Gower-street, W.C.1.

ESSEX.—BUILDING.—The C.C. are inviting tenders for two timber-constructed council junior schools, each to accommodate 500 children, at Loughton and South Hornchurch. Mr. J. Stuart, F.R.I.B.A., County Architect, Chelmsford, has prepared the plans.

FINSBURY.—REBUILDING.—Messrs. T. G. Waterman, Ltd., Crown-works, Boundary-road, Plaistow, E.13, have secured the contract for the pulling down and rebuilding of the "Shakespeare's Head" public-house in Percival-street, E.C.1, for Messrs. Charrington and Co., Ltd., Anchor Brewery, E.1. The architect is Mr. Sidney C. Clark, F.R.I.B.A., 86, Fenchurch-street, E.C.3.

FINSBURY.—DRILL HALL.—The tender of Messrs. E. H. Burgess, Ltd., 34, Grosvenor-gardens, S.W.1, has been accepted for a drill hall and battery headquarters at 79-85, Worship-street, E.C., for the City of London Territorial Army and Air Force Association, City-road, E.C.1. The plans have been prepared by Mr. Albert L. Abbott, F.R.I.B.A., 6, Queen Anne's-Gate, S.W.1, and the quantities by Mr. F. N. Falkner, F.S.I., 46, Berners-street, W.1.

GREENFORD.—SCHOOL.—Messrs. Pitchers, Ltd., 57, Ashburton-grove, Holloway, N.7, have the contract for a new junior and infants' mixed school in Greenford-road, for the Very Rev. R. Kennedy. The architect is Mr. J. E. Sterrett, A.R.I.B.A., 34A, Buckingham-gate, S.W.1, and the quantity surveyors are Messrs. Hawkes and Hawkes, 1, Gray's Inn-place, W.C.1. The cost is estimated at £10,000.

HACKNEY.—ADDITIONS.—The B.C. has accepted, subject to the consent of the Electricity Commissioners, the tender of Messrs. E. A. Roome, and Co., Ltd., Urswick-road, E.9, at £4,851, for an additional floor on the domestic apparatus workshop.

HAMMERSMITH BRIDGE - ROAD. — PREMISES.—The Prudential Assurance Co., Ltd., Holborn Bars, E.C.1, has had plans prepared by their Estates Department for a large block of premises at Nos. 38-44. No contracts let.

HENDON.—AERODROME.—H.M. Air Ministry has placed a contract with Messrs. F. Troy and Co., Ltd., 194, Finchley-road, N.W.3, for alterations and additions to the aerodrome.

HESTON.—MAISONETTES. — Messrs. Bucks and Middlesex Estates, Ltd., of Twyford, Berks, are proposing 40 maisonettes on the site of Worthing House, North Hyde-lane.

HOUNSLOW.—ADDITIONS.—The Heston and Isleworth E.C. are inviting tenders for

alterations and additions to Grove-road schools, Hounslow. The Borough Surveyor, Mr. J. G. Carey, has prepared the plans.

HOUNSLOW.—HOUSES.—Messrs. R. Lancaster and Sons, of 30, Ealing-road, Wembley, are to erect 206 houses and 47 shops at Hounslow West, bounded on the north by the Great West-road, south by Bath-road, and east by Vicarage Farm-road.

ISLINGTON.—EXTENSIONS.—The City of London Corporation has recommended the tender of Messrs. F. Braby and Co., Ltd., 352, Euston-road, N.W.1, at £2,998, for further covered accommodation at the Metropolitan Cattle Market.

KENSINGTON.—LIBRARY.—The B.C. has recommended the tender of Messrs. Prestige and Co., Ltd., 149, Grosvenor-road, S.W.1, at £38,726, for erecting the new central library. The architect is Mr. Percy Thomas, O.B.E., P.P.R.I.B.A., of Cardiff.

LEE.—SCHOOL.—Mr. J. H. Beart Foss, F.R.I.B.A., 9, The Common, Ealing, W.5, is the architect for new school buildings at Northbrook C. of E. School, Hedgley-street. No contracts placed.

LEYTONSTONE. — PREMISES. — Messrs. Charrington and Co., Ltd., Anchor Brewery, Mile End-road, E.1, have placed a contract with Messrs. W. Loweth and Sons, Ltd., 67, Downs Park-road, Hackney, E.8, for the rebuilding of the "Bell" public house, 468, High-road, E. The plans have been prepared by the brewery architect, Mr. S. J. Funnell, L.R.I.B.A., and the quantities by Mr. Sydney Gordon, Finsbury House, Moorgate, E.C.

LONDON. — BUILDING. — The L.C.C. has placed contracts with Messrs. W. H. Gaze and Sons, Ltd., 23, High-street, Kingston, at £6,933, for reconditioning the north-east block of St. Clement's Hospital, Poplar; Messrs. Gee, Walker and Slater, Ltd., Fitzmaurice-place, W.1, at £59,250, for additional isolation and staff accommodation at Southern Hospital, Dartford. £12,880 is to be spent on the erection of dwellings on the second portion of the Quaker-street area, Stepney.

MIDDLESEX.—BUILDING.—The C.C. recommend the following: the tender of Messrs. E. Plaistowe and Sons, Ltd., of Southall, at £6,290, for the adaptation of the buildings of the former Cuckoo Schools, Hanwell, for use as a community centre; the tender of Messrs. A. E. A. Prowting, Ltd., of Ruislip, at £1,963 17s. 10d., for a sports pavilion on the school playing fields at Mill Hill; the tender of Mr. Albert Monk, of Edmonton, at £8,799 15s. 1d., for a youth community centre in Philip-lane, Tottenham; and the tender of Messrs. Jones and Sons, of Maidenhead, at £59,469, for an elementary school in Porlock-avenue, South Harrow. The Council approved in principle the erection of divisional education offices at Twickenham. Tenders are to be obtained. The Council also approved in principle the erection at the Middlesex Colony, Shenley, of two isolation annexes. The County Architect is to invite tenders for adaptation of Acton County School buildings for use as annexe college, and adaptation of buildings for use as an approved school to replace Northcotts Approved School, at Pishobury Park, Sawbridgeworth.

PLAISTOW.—HOSPITAL.—Extensions are to be made to the out-patients' department of the Invalid and Crippled Children's Hospital, Balaam-street, E.13. The architect is Mr. H. P. G. Maule, F.R.I.B.A., 12, Stratford-place, W.1.

SANDERSTEAD.—PETROL STATION.—Messrs. Lex Garages, Ltd., Lexington-street, W.1, are to build a service and petrol-filling station at Mitchley Hill and Limpsfield-road, for which plans have been prepared by Messrs. Farmer and Dark, 87, Buckingham Palace-road, S.W.1. The contractors are Messrs. John Laing and Sons, Ltd., Bunns-lane, Mill Hill, N.W.7.

SILVERTOWN.—HEADQUARTERS.—Premises at Evelyn-road, Victoria Docks, E., are to be reconstructed as R.A.S.C. headquarters, for the Essex Territorial Army and Air Force Association, Market-road, Chelmsford. The architects are Messrs. Roddick, Colvin and Clark, 40, Great James-street, W.C.1, and the quantity surveyors are Messrs. Evans and Lynde, 2, Dyers-Buildings, Holborn, E.C.1. No contracts placed.

SLOUGH.—FACTORY.—Plans have been approved by the T.C. for Messrs. Power Specialities, Ltd., for a factory and offices in Bath-rd. West.

SLOUGH. — OFFICES. — Messrs. Langley Alloys, Ltd., are to erect offices and factory off Station-rd., Langley. Plans have been approved by the T.C.

SLOUGH.—FACTORIES.—The T.C. has approved plans for the Slough Estates, Ltd., of a Bijou factory, 124a, off Edinburgh-avenue, and for 27 Bijou factories, 277-303, Aberdeen-avenue.

SOUTH HARROW. — SHOWROOMS. — Consisting of garage and showrooms, four shops with assembly hall above, are contemplated on a site at the corner of Alexandra-avenue and Somervell-road, by Wrotham Park, Ltd., 202, Northolt-road, South Harrow. The surveyors are Messrs. Barr and Mead, Ltd., 202, Northolt-road, South Harrow. No contracts placed.

STEPNEY.—DWELLINGS.—The B.C. recommend the tender of Messrs. W. H. Gaze and Sons, Ltd., 19, High-street, Kingston, at £22,363, for 31 dwellings on the West India House site.

SURBITON.—FLATS.—Messrs. Petty and Gander, 4, Oakleigh-court, Churchview-road, Twickenham, propose a block of 32 flats and 12 garages at Esher Lodge-gardens, Langley-road. Plans prepared by own staff.

TWICKENHAM.—ADDITIONS.—The Corporation are inviting tenders for erection and completion of various buildings at the London-road depot, London-road, the refuse-disposal works, Craneford-way, and the North-lane depot, North-lane. Mr. Gilbert R. King, F.S.I., Borough Engineer and Surveyor, has prepared the plans.

WADDON.—FACTORIES.—The Croydon C.B. has approved plans for the Croydon Factory Estate, Ltd., Staffa Works, Staffa-road, Lea Bridge-road, Leyton, E.10, for two factories, Nos. 25 and 26, Progress-way, on the Croydon Factory Estate, and for Messrs. Commercial Structures, Ltd., of the same address, for alterations and additions to factories Nos. 22 and 23, Progress-way.

WAPPING.—LICENSED PREMISES.—Messrs T. G. Waterman, Ltd., Crown Works, Boundary-road, Plaistow, E.13, are pulling down and rebuilding the "China Ship" public house in Orton-street, Wapping, E., for Messrs. Charrington and Co., Ltd., Anchor Brewery, E.1. The architect is Mr. Sidney C. Clark, F.R.I.B.A., 86, Fenchurch-street, E.C.3.

WOOLWICH.—STORES. — Rebuilding and extension of their drapery stores, 102-106, Powis-street, S.E.18, is proposed by Messrs. Cuff and Co., Ltd., who have placed a contract with Messrs. Thomas and Edge, Ltd., Green's End, S.E.18. The architect is Mr. A. G. Channer, L.R.I.B.A., Kingsley Hall, Thomas-street, Woolwich, S.E.18.

A.R.P. SCHEMES

BERMONDSEY.—The A.R.P. Committee have given instructions for the work in connection with adaptations and new constructions at various A.R.P. depots, at a cost of £4,289, to be put in hand as soon as the Lord Privy Seal has approved the expenditure.

BOOTLE.—Board of Management of the General Hospital Health Centre and Linacre Hospital are proposing A.R.P. works to cost £3,841.

COSELEY.—The U.D.C. have approved plans for 13 air raid shelters for Cannon Iron Foundries, Ltd., and for Lanesfield Voluntary First Aid Committee to erect first-aid station on Birmingham-Wolverhampton road.

DONCASTER.—Messrs. Harold Arnold and Son, Ltd., building contractors, Printing Office-street, have prepared plans for reinforced concrete air raid shelters for their employees.

DUDLEY.—The T.C. propose provision of an air raid shelter at the New Market Hall, to accommodate 4,500, at an estimated cost of £40,000. Architect, Messrs. A. T. and B. Butler, F. and A.R.I.B.A., 31, Priory-street. Plans provide for well-equipped shelter, including operating theatre, doctors' room, decontamination centre.

DUNDEE.—Expenditure of £8,327 has been proposed for air raid equipment and shelters at the Corporation Gas Works.

FINSBURY.—The Special (Air Raid Precautions) Committee recommend the construction of a control room and shelter at an estimated cost of £6,901.

HARROW.—The U.D.C. is to build an A.R.P. depot, including workshops, shelters, three cottages for workmen, etc., at a cost of £33,685. Plans have been prepared by Mr. H. W. Rackham, F.S.I., Council Offices, Harrow-on-the-Hill.

SURREY.—The C.C. invite tenders for a decontamination building, Ewell Depot, Ewell.

WIMBLEDON.—B.C. has received sanction of Home Office for construction of additional trenches and shelters in South Wimbledon.

PUBLIC WORKS

GT. BRITAIN.—Among contracts advertised in this issue by local authorities as being open to tender are: Wimbledon Corporation — electricity sub-station, Wrights-alley South-side, Wimbledon Common; Sherborne U.D.C.—24 dwellings, Horsecastles; Spalding R.D.C.—12 houses, Moulton Sea's End; Derby C.B.—139 houses, Radford-street, 163 houses, Roe Farm; Oldbury B.C.—50 houses, Causeway Green Estate; Prestwich R.C. School—school in Highfield-road.

GT. BRITAIN (Ministry of Health).—Following are notes on some loans sanctioned by the Minister of Health: Abingdon R.D.C.—£20,415 for works of sewerage and sewage disposal; Burnley C.B.C.—£50,000 for works of sewerage and sewage disposal; Chester C.B.C.—£37,594 for 89 houses and 24 flats, Loche Estate; Crewe B.C.—£87,144 for 250 houses, Underwood-lane; Great Yarmouth C.B.C.—£30,500 for purchase of part of Gorleston Estate; Lancaster C.C.—£58,770 for purposes of Ashton-in-Makerfield and Upholland Grammar School; Newcastle-upon-Tyne C.C.—£10,000 for restoration of and repairs to old town walls and castle; St. Pancras M.B.C.—£13,200 for purposes of Air Raids Precautions Act, 1937; Sheffield C.B.C.—£49,325 for 65 flats, Edward-street site, Scheme No. 2; Southport C.B.C.—£30,165 for land and foreshore at Hesketh for open space; Spilsby R.D.C.—£16,683 for works of water supply for various parishes; Wolverhampton C.B.C.—£23,492 for roads and sewers and erection of pumping station and equipment on Willenhall-road site; Yorks, N. Riding C.C.—£32,144 for sen. coun. sch., Northallerton; Swadlincote U.D.C.—£37,877 for 120 houses, Oversetts-road Meadow-lane housing site; Teignmouth U.D.C.—£45,200 for works of sewerage and sewage disposal; Tottenham B.C.—£123,000 for 216 flats, Allington Estate; West Dean R.D.C.—£26,200 for 50 houses, Sunny Bank Estate, Coleford; 8 houses, Pillowell; 8 houses, Yorkley; and the provision of gas and electric light services in connection with the 50 houses, Sunny Bank Estate.

NEW CINEMAS

GRAYS.—Mr. Louis Morris, 52, Shaftesbury-avenue, W.1 proposes to erect a cinema at Quarry Hill. Plans have been prepared by Messrs. J. Owen Bond and Son, 26, Tombland, Norwich.

LEWISHAM.—The B.C. have approved the erection of a cinema at the corner of Dartmouth-road, Sydenham-road, and Albion Villas-road, Forest Hill. The architect is Mr. H. V. Milnes Emerson, A.R.I.B.A., Underwood, Speer-road, Thames Ditton.

MANCHESTER.—Messrs A. G. Deacon and Co., 13, St. Anns-street, propose the erection of a cinema and car park in Wilmslow-road and Heaton-road, Withington. The architects are Messrs. Drury and Gomersall, 7, Oxford-road, Manchester.

Structural Steelwork for Basement Air-Raid Shelters.

In the Draft Provisional Code for Air-Raid Shelters issued by the Home Office, particulars are given of the Government requirements as regards basement shelters. Conforming to these requirements, and in compliance with the specified loads and stresses, the British Steelwork Association has prepared two designs showing the application of structural steelwork. These designs—a frame type and a wall-bearing type—provide for a wide range in the size of basements, and particulars are given in tabular form on each drawing. Where basements do not conform to the size shown, the same system can be adapted to meet requirements. Lithographed copies of the drawings are available on application to the British Steelwork Association, Steel House, Tothill-street, Westminster, S.W.1.

CONTRACTS OPEN

For some contracts still open, but not included in this list, see previous issues. Those with an asterisk are advertised in this number. Certain conditions beyond those given in the following information are imposed in some cases, such as that advertisers do not bind themselves to accept the lowest or any tender, that a fair wages clause shall be observed, that no allowance will be made for tenders; and that deposits are returned on receipt of a bona-fide tender, unless stated to the contrary. The dates at the head of paragraphs are those for the submission of tenders: a dagger (†) denotes closing date for applications; the name and address at the end refer to the person from whom particulars may be obtained. Abbreviations: (A) for A.R.I.B.A.; B. of E. for Board of Education; B.C. for Borough Council; B.E. for Borough Engineer; B.S. for Borough Surveyor; C. for Clerk; C.B. for County Borough; C.C. for County Council; C.E. for County Engineer; C.S. for County Surveyor; D.S. for District Surveyor; E. for Engineer; E.C. for Education Committee; (F.) for F.R.I.B.A.; (L.) for L.R.I.B.A.; M.W.B. for Metropolitan Water Board; M.H. for Ministry of Health; M.T. for Ministry of Transport; P.C. for Parish Council; R.D.C. for Rural District Council; S. for Surveyor; T.C. for Town Clerk and Town Council; and U.D.C. for Urban District Council.

BUILDING.

JUNE 30.

†**Bromsgrove R.D.C.**—New Council chamber and extensions to Council offices, Birmingham-rd. Chas. E. Cox, E. and S. Dep. £5 5s.

✱**Southport C.B.**—Extensions, Birkdale School, Windy Harbour-rd. T.C. Dep. £5 5s.

JULY 1.

†**Fife C.C.**—Infant dept. at Leslie H.G. school. C. R. Douglas & Son, F.S.I., Prudential-chambs., East Port, Dunfermline. Dep. £1 1s.

†**South-West University College, Exeter.**—Gymnasium. E. Vincent Harris, A.R.A., architect, 19, West Eaton-pl., London, S.W.1. Dep. £10 10s.

JULY 3.

✱**Orpington U.D.C.**—Extension, council offices. Messrs. Robert Atkinson (F.), 13, Manchester-sq., W.1. Dep. £3 3s.

JULY 5.

Barking B.C.—Alterations to Westbury school. C. C. Shaw (A.), Borough Architect. Dep. £1 1s.

Bedford R.D.C.—3 houses, Great Barford; 2 houses, Cople. S. K. Johnson, Council-chambs., 6a, St. Mary's-st. Dep. £2 2s.

Castlegregory.—Alterations and repairs at Castlegregory Church and Parochial House, for Rev. W. O'Connor, P.P. B. O'Flynn & Son, architects, 60, South Mall, Cork. Dep. £10.

Freebridge Lynn R.D.C.—10 houses in 2 parishes. A. Weatherbed, C., 24, King-st., King's Lynn. Dep. £1 1s.

Halstead R.D.C.—23 pairs of houses on various sites. G. F. Dearman, S., Council Offices, Colchester-rd. Dep. £2 2s.

Hatfield R.D.C.—14 houses at Essendon, nr. Hatfield. J. R. Howarth, S. Dep. £2 2s.

Islington B.C.—Extra high-tension switchgear room, electricity station, Eden-gr., N.7. E. C. P. Monson (F.), Finsbury Pavement House, 120, Moorgate, E.C.2. Dep. £3.

Kirbymoorside R.D.C.—33 houses in two parishes. W. Sturdy, C., Market-pl. Dep. £1 1s.

London (H.M.O.W.).—Extension South Woodford S.D.O. Room 71, Ground Floor, H.M.O.W., S.W.1. Dep. £1.

Newport (Mon.).—External painting (part only) mental hospital, Caerleon. Borough Architect. Dep. £1 1s.

Northern Ireland Government.—R.U.C. barrack at Oldpark-rd., Belfast. Secretary, Ministry of Finance (Room 123), May-st., Belfast. Dep. £1.

Oakham U.D.C.—8 houses, Cold Overton-rd. S. Dep. £1 1s.

Ormskirk U.D.C.—12 houses in Tower-hill, Ormskirk. S., Burscough-st. Dep. £2 2s.

Peebles (H.M.O.W.).—Unit automatic exchange. Architect, H.M.O.W., 122, George-st., Edinburgh, 2. Dep. £1.

Stroud U.D.C.—82 houses at Uplands. F. S. Cutler, Chartered E. and S. Dep. £2 2s.

Weardale R.D.C.—Adaptation of Fairfield House, Stanhope, for offices, and installation in offices of central heating. J. R. Ridley, Sanitary S., Stanhope.

West Monkseaton.—R.C. senior school. R. Burke, architect, Singleton House, Northumberland-rd., Newcastle-upon-Tyne, 1. Dep. £3 3s.

JULY 6.

Ballycastle U.D.C.—Bathing pool and other works at White Rocks, Bayview-rd. R. Robinson, E. Dep. £1 1s.

Cornwall C.C.—County offices, County Hall, Truro. County Architect, County Hall. Dep. £5 5s.

Cumberland.—Junior and infants' elementary school at Silloth. J. H. Haughan (A.), County Architect, 4, Alfred-st. North, Carlisle. Dep. £2.

Lichfield R.D.C.—18 houses in Colton, near Rugeley. J. G. Rimand, E. and S. Dep. £2 2s.

Long Ashton R.D.C.—Alterations and repairs to 7 houses at Nailsea. Maynard Froud & Stevens, chartered surveyors, St. Stephen's-chambs., Baldwin-st., Bristol. Dep. £2.

Malden and Coombe T.C.—23 covered shelters and 4 surface shelters on 7 sites. A. R. Goldthorp, B.E.

Manchester E.C. — Lancastrian (Physically Defective) School, Parrs Wood, East Didsbury. S., Education Offices, Deansgate. Dep. £2 2s.

Manchester E.C. — St. Clare's R.C. School, Blackley. F. Hindley, F.I.A.S., 51, South King-st. Dep. £2 2s.

Newcastle-upon-Tyne T.C.—Two rent offices in west end of city. City Architect, 18, Cloth-market.

North Antrim Regional E.C.—Alterations and additions to Carrowreagh public elementary school, and repairs to premises of Causeway memorial public elementary school. J. S. Munce (L.), 24, Arthur-st., Belfast.

North Antrim Regional E.C.—Public elementary school building at Mosside. R. Robinson, architect, Town Hall, Ballymoney.

Reading C.B.—Bowls pavilion at Palmer-pk. B.S. Dep. £1 1s.

Smethwick C.B.—A.R.P. cleansing station and stores, Reginald-rd., and air-raid shelter trenches. R. Fletcher, B.E. and S. Dep. £2 (each contract).

JULY 7.

Ardrossan T.C.—2 shops at Parkhouse and Whitlees. Black & Shapley, architects, 15, Barr-st.

Biggleswade R.D.C.—12 houses, Shefford, Beds. F. C. Levitt, architect, Commerce House, Market-sq. Dep. £2 2s.

Birmingham T.C.—Premises for weights and measures department at junction of Corporation-st. and Moland-st. J. Manzoni, City E. and S. Dep. £5 5s.

Birkenhead C.B.—Five houses on south side of Hoylake-rd. B.E. and S. Dep. £2 2s.

Coventry T.C.—Cottage for water dept. at Meriden Shafts pumping station site. A. F. Underhill (L.), Housing Director. Dep. £3 3s.

✱**Hendon B.C.**—Surgical unit, isolation hospital, Goldsmith-av. B.E. and S. Dep. £3 3s.

Irish Land Commission.—1 dwelling-house and out-office, Lands of Ballynalouhy, Ballinahassig; 5 dwelling-houses and 5 out-offices, Ballybrack; 1 dwelling-house and out-office, Corrandrum; 1 dwelling-house and out-office, Ralish; 1 dwelling-house and out-office, Dangan. M. Deegan, Sec., Upper Merrion-st., Dublin. Dep. £1.

Leicester T.C.—204 houses and two shop premises, New Parks estate. Housing Architect, Charles-st. Dep. £1 each.

London (H.M.O.W.).—Bideford Post Office and Garage. Room 71, Ground Floor, H.M.O.W., S.W.1. Dep. £1.

✱**Prestwich.**—R.C. school, Highfield-rd. H. Greenhalgh, P.A.S.I., 15, Mawdsley-st., Bolton. Dep. £2.

Stroud R.D.C.—50 houses on various sites. R. Bird, S. and E., John-st. Dep. £2 2s.

✱**Surrey C.C.**—Decontamination centre, Ewell depot. C.E. Dep. £2 2s.

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Wakefield T.C.—Pavilion, conveniences and entrance gates, King George's playing field, Eastmoor. S. Hutton, City E. and S.

West Bromwich C.B.—10 houses on Oak-ln. estate. B.E. and S. Dep. £2 2s.

JULY 8.

Abertillery and District Water Board.—New depot at Kendon-rd., Crumlin. W. C. Goddard, E., Midland Bank-chambs., Newport, Mon. Dep. £2 2s.

Alfreton U.D.C.—Lodge, pavilion, store and conveniences, and shelter at Riddings recreation ground. C. F. R. Cleaver, C. Dep. £2 2s.

Bexhill T.C.—Repairs to various schools. B.S.

Bristol T.C.—106 houses, Filwood Park housing estate. City Architect, Eagle House, Colston-av. Dep. £1.

Bromley T.C.—Repairs and redecorations to cemetery buildings. Harold Cliffe, B.E. Dep. £1.

East Kesteven R.D.C.—6 4-bedroom houses, 6 3-bedroom, 8 bungalows, road, water main and sewer. Architect and Surveyor, Council Offices, Northgate, Sleaford.

Fife C.C.—New clinic, Netherton, Broad-st. Dunfermline. C. R. Douglas & Son, surveyors, Prudential-chambs., East Port, Dunfermline. Dep. £1 1s.

✱**Finsbury B.C.**—Alterations, Old-st. underground convenience. B.E.

✱**Norwich T.C.**—Norman schools reorganisation. City Architect, City Hall.

Walsall E.C.—Alterations to conveniences and re-roofing of play-shelter at Hillary-st. council school. B.E.

JULY 10.

Amble U.D.C.—50 houses, etc. Hetherington & Wilson, chartered architects, 27, Bondgate Without, Alnwick. Dep. £1 1s.

Brighton C.B.—Four shops and flats on East Moulsecoomb estate. B.E. and S. Dep. £2 2s.

Buckie T.C.—20 houses. B.S.

Coventry T.C.—Additional buildings adjoining Longford power station. D. E. E. Gibson (A.), City Architect, 1a, Warwick-row. Dep. £3 3s.

Croydon C.B.—24 flats and sundry works, Windmill-rd. redevelopment area. B.E. Dep. £2 2s.

✱**Dagenham T.C.**—Central depot, Rainham-rd. B.E. and S. Dep. £5 5s.

Derbyshire C.C.—Senior mixed school at Breaston. County Architect, St. Mary's Gate, Derby. Dep. £2 2s.

✱**Erith T.C.**—Works at various schools. B.E. and S. Dep. £1 1s. each.

Grimsby E.C.—Alterations and additions to education offices. William Wells, architect, Prudential-chambs., Victoria-st. Dep. £1 1s.

✱**Halifax C.B.**—15 houses and shops, Nursery-la. B.E., Crossley-st. Dep. £2 2s.

Newcastle-under-Lyme T.C.—1 house and 3 shops, Liverpool-rd., Cross Heath. J. Griffith, T.C. Dep. £1 1s.

✱**Newport C.B.**—Assembly hall block, civic centre. T.C. Dep. £5.

✱**Norfolk C.C.**—Extensions, Mundesley Area School. Secretary to the Education Committee, Stracey-rd., Norwich. Dep. £2 2s.

Norwich T.C.—Villa for 60 patients, Hellesdon mental hospital. City Architect. Dep. £2 2s.

✱**Peterborough T.C.**—Pumping station, Wilsthorpe waterworks, nr. Bourne, and 62 houses, Park-ln. estate. City E. Deps. £2 2s. and £2 (respectively).

Scottish Special Housing Association, Ltd.—170 timber houses, Hurlford, Ayrshire. Stewart & Paterson, architects, 16, Blythswood-sq., Glasgow.

Wallasey C.B.—Electricity sub-station and public shelter on Flynn's Piece, Grove-rd. B.E.

Warrington T.C.—Extension of locomotive shed at Longford gasworks. A. Cook, Engineer and Manager, Gas Offices, Mersey-st.

West Bromwich Corporation.—Sub-station, Cooper Hill-st. F. Jasper Cole, Borough Electrical Engineer and Manager, 296, High-st. Dep. £1.

Wood Green B.C.—Repairs schools, Noel Park, Alexandra and Lordship-ln. B.E. and S. Dep. £1 1s.

JULY 11.

✱**Bootle C.B.**—Stone coping and wrought-iron railings, Breeze Hill and Linacre improvements. B.E. and S. Dep. £1 each.

✱**Chester C.C.**—Sale, Cecil-av. C. Snr. school. F. Anstead Browne (F.), County Architect, The Castle.

Commissioners of Public Works.—Erection of Cooneal National, Rathdrum National, and Broadpath National schools. Geo. P. Fagan, Sec., Office of Public Works, Dublin. Dep. £1.

Croydon C.B.—Dressing-room at Norwood Club, Avenue-rd., South Norwood. B.E. Dep. £2 2s.

Dearne U.D.C.—16 houses, Highgate-ln. W. H. Adams (A.), Council Offices.

Enfield U.D.C.—R.C. senior school. Sandy & Norris, architects, 134, Newport-rd., Stafford. Dep. £2 2s.

Essex C.C.—2 timber schools, Loughton Valley Hill and South Hornchurch. Blacksmiths-ln. H. W. Collis, County Accountant, County Hall, Chelmsford.

Filey U.D.C.—Two public lavatories. E. Dunbavand, S. Dep. £2 2s.

London (H.M.O.W.).—Alterations, Shrewsbury Telephone Manager's Office, Room 71, Ground Floor, H.M.O.W., S.W.1. Dep. £1.

North East Lindsey Joint Hospital Board.—Extensions to Isolation Hospital, Osgodby. J. P. Mason, S., Caistor, Lincs. Dep. £5 5s.

Nottingham T.C.—Gymnasia, etc., William Crane school, Aspley. R. M. Finch, City E. and S. Dep. £2.

Wallasey C.B.—First-aid hut at Maddock-rd. B.E. Dep. £1 1s.

Windermere U.D.C.—Public conveniences, motor park, Glebe-rd. E. Dep. £2 2s.

JULY 12.

Beckenham T.C.—Permanent concrete lining of existing air-raid precautions trench shelters in Hospital Meadow, McAndrew playing fields and Churchfields recreation ground. J. Dove, B.E. and S. Dep. £2.

Beckenham T.C.—Cleansing depot and warehouse at Churchfields highways depot. J. Dove, B.E. and S. Dep. £2.

Birkenhead C.B.—Workshops, Transport Depot, Laird-st. B.E. and S. Dep. £2 2s.

Brighton C.B.—28 non-parlour type houses on sites of Nelson-st. and Carlton-st. B.E. and S. Dep. £2 2s.

Caernarvonshire E.C.—Gymnasium and caretaker's house at Llandudno county school, and alterations and additions to Brynrefail county school. W. Lloyd Jones, County Architect, Caernarvon. Dep. £2 2s.

Huddersfield C.B.—26 small houses for aged persons on Fir-rd. housing estate, Paddock. B.E. and S., High Street-bldgs. Dep. £3 3s.

London (H.M.O.W.).—Tamworth post office and Hathersage telephone exchange. Room 71, Ground Floor, H.M.O.W., S.W.1.

Reading C.B.—Electricity transformer sub-station in Newlands-av., off Peppard-rd., Caversham. Electrical Engineer and Manager, Market-pl. Dep. £1 1s.

✱**Walthamstow B.C.**—Electricity sub-station and works, Hale End-rd. Frank H. Heaven (A.), Old Monoux-bldg., High-st. Dep. £2.

✱**Wimbledon B.C.** — Electricity sub-station. Wright's-alley, Southside, Wimbledon Common Chief Engineer and Manager, Durnsford-rd.

JULY 13.

Bingham R.D.C.—14 houses on four sites. C. W. Kendrick, S. Dep. £2.

Pembrokeshire E.C.—New buildings and alterations to existing premises of Maenclochog school. O. T. Thomas, County Architect, Haverfordwest. Dep. £3 3s.

Pembrokeshire E.C.—Alterations and additions to sanitary offices at Stepaside school. O. T. Thomas, County Architect, Haverfordwest.

Tunbridge Wells T.C.—Reinforced concrete stores and air raid shelter in Albion-rd. yard. Borough Electrical Engineer, "Mountfield," 33, Grove Hill-rd. Dep. £2 2s.

Wantage R.D.C.—141 houses, various parishes. S. Dep. £2 2s.

Winslow R.D.C.—32 houses, various parishes. Raymond C. White, Brooke House, Market-sq., Aylesbury. Dep. £2 2s.

Yeovil R.D.C.—Pair of houses at Haselbury Plucknett; 10 houses at Martock; pair of houses at West Camel. Petter, Warren & Roydon Cooper (FF.), architects, Old Oxford Inn, West Hendford, Yeovil.

JULY 14.

Easingwold R.D.C.—20 houses on three sites. C. W. C. Needham (F.), architect, 3, Duncombe-pl., York. Dep. £2 2s.

London (H.M.O.W.).—Extension, Newcastle West telephone exchange. Room 71, Ground Floor, H.M.O.W., S.W.1.

Selby R.D.C.—32 houses on various sites. R. F. Braithwaite, S., 22, Park-st. Dep. £1 1s.

Shropshire E.C.—Electric light and power installations at Wellington senior mixed council, and Wellington boys' high school. A. G. Chant, County Architect, 5, Belmont, Shrewsbury. Dep. £1 each.

✱**Southampton C.B.**—Buildings, etc., River Itchen Supply Works, Otterbourne, Hampshire. Waterworks Office, Civic Centre. Dep. £5.

Uckfield R.D.C.—12 houses at Uckfield, 6 at Fletching, 6 at Danehill, 12 at Wadhurst, 6 at Blackham, construction of estate road with surface water drainage work at Durgates, Wadhurst. T. Burdett, S. Dep. £2 2s. each contract.

JULY 15.

Halifax T.C.—Pumping station, Mixenden. D. T. Lloyd Jones B.E. Dep. £1 1s.

Northumberland C.C.—Permanent trench lining, Gosforth central park. Alex. Cheyne, C.S., Newcastle-on-Tyne. Dep. £2 2s.

✱**Spalding R.D.C.**—12 houses, Moulton Sea's End. F. Bernard Saunders, architect, 8, Herring-la. Dep. £2 2s.

Twickenham B.C. — Alterations and additions, London-rd. depot, refuse disposal works, North-la. depot, Teddington. B.E. and S. Dep. £2.

JULY 17.

Bromley T.C.—A.R.P. trench linings, at Martins Hill site, Whitehall recreation ground site, and New Street-hill site. H. Cliffe, B.E. Dep. £1 each.

Douglas.—Alterations and additions to St. Mary's Catholic schools, for managers. A. J. Davidson (A.), 16-18, Athol-st. Dep. £2 2s.

✱**Leeds T.C.**—(a) Roads and footpaths. (b) 14 houses, Brianside (Extension), Seacroft. R. A. H. Livett (A.), 26, Great George-st.

✱**London (H.M.O.W.).**—Shirebrook telephone exchange. Room 71, Ground Floor, H.M.O.W., S.W.1. Dep. £1.

Malew Parish Commissioners.—6 houses at Ballasalla. A. J. Davidson (A.), 16-18, Athol-st., Douglas. Dep. £2 2s.

Northern Ireland Government.—New R.U.C. barrack at Carrickfergus, Co. Antrim. Sec., Ministry of Finance (Room 128), May-st., Belfast. Dep. £1.

✱**Oldbury B.C.**—Underground shelters, various schools. B.E. and S. Dep. £2 2s.

Somerset C.C.—Alterations and additions, Wellington senior school. R. O. Harris, County Architect, Park-st., Taunton. Dep. £5 5s.

✱**West Riding C.C.**—Electrical installation, Bingley school and Technical Institute. Education Officer, County Hall, Wakefield.

JULY 18.

Barnstaple T.C.—48 houses at Tresise's Field, Derby-rd. B.S., The Castle. Dep. £3 3s.

Hemsworth U.D.C.—24 bungalows at Tombridge-cres., Kinsley. A. Wright, C. Dep. £2 2s.

✱**London (H.M.O.W.).**—Hednesford telephone exchange. Room 71, Ground Floor, H.M.O.W., S.W.1. Dep. £1.

Portslade-by-Sea U.D.C.—28 flats on site adjoining east side of Church-rd. D. V. Howard, S. Dep. £2 2s.

✱**Sherborne U.D.C.**—24 dwellings, Horsecastles. T. W. Sharpe (L.), Council Offices, South-st. Dep. £5.

Ware U.D.C.—43 houses at Vineyard estate, off Musley-ln. R. W. Grantham, architect, The Priory.

JULY 19.

✱**London (H.M.O.W.).**—Chapel Brampton telephone exchange, Thornton Abbey telephone repeater st. Room 71, Ground Floor, H.M.O.W., S.W.1. Dep. £1 each.

✱**Merton and Morden U.D.C.**—Chapel and cemetery buildings, Garth-rd., Lower Morden. Albert J. Thomas F.), 31a, Sloane-st., S.W.1. Dep. £3 3s.

✱**Manchester T.C.**—235 flats, Hulme, 181 flats, 8 shops and 4 garages, Collyhurst. T.C. Dep. £2 2s.

York T.C.—32 houses and 36 flats, Regent-st. clearance area. C.E. Dep. £1 1s.

JULY 20.

Downham and District Joint Fire Brigade Committee.—Works in connection with adaptation of 9 cottages into fire station. H. J. Diver, Chief Officer, Fire Brigade, Council Offices. Dep. £1 1s.

Northwich U.D.C.—Alterations and additions to Council House. F. L. James, E. and S. Dep. £2 2s.

✱**Oldbury B.C.**—50 houses, Causeway Green estate. B.S., Municipal Bank-chambs. Dep. £2 2s.

Witham U.D.C.—Caretaker's house and public lavatories on recreation ground near Rickstones-rd. S. Dep. 10s. 6d.

JULY 21.

✱**London (H.M.O.W.).**—Hexham post office, Coasham telephone exchange. Room 71, Ground Floor, H.M.O.W., S.W.1. Dep. £1. each.

North Eastern Housing Assoc., Ltd.—(*a*) 117 houses in Croft and Middlegate areas, Hartlepool, and (*b*) 136 houses, Blue Quarries site, Gateshead. (*a*) J. H. Miers, B.E., Hartlepool, and (*b*) F. H. Patterson, B.S., Gateshead. Deps. £3 3s. each.

St. Ives (Cornwall) Corporation.—Town hall and municipal offices. W. Rainey-Edwards, T.C. Dep. £2 2s.

JULY 22.

Horwich Industrial Co-operative Society, Ltd.—Alterations to central premises, Lee-ln. Sec., 86, Lee-ln. Dep. £2 2s.

Tiverton T.C.—98 houses at Westexe South and 1 house at Allers, Tiverton. Capt. W. H. Duncan Arthur, B.S. Dep. £3 3s.

JULY 24.

✱**Kingston-on-Thames T.C.**—Stage and dressing-rooms, public baths. B.S. Dep. £2 2s.

South Cork Board of Public Health.—375 houses. B. O'Flynn, architect, 60, South Mall, Cork. Dep. £10.

Stockport T.C.—Nurses' home extension and mortuary block at Stepping Hill Hospital. Harry S. Fairhurst & Son, architects, 55, Brown-st., Manchester.

✱**Whitley and Monkseaton U.D.C.**—Municipal offices. Cordingley & McIntyre (F.), The College, Durham. Dep. £2 2s.

JULY 26.

✱**Derby C.B.**—139 houses, Radford-st., 163 houses, Roe Farm. C. H. Aslin (F.), Gower-st. Dep. £1 1s. each.

✱**Norton R.D.C.**—116 houses, various townships. C., R.D.C. Offices, Malton. Dep. £2 2s.

AUGUST 1.

Co. Leix.—Generating station, nr. Portarlington, for Electricity Supply Board. Chief Design E., 37, Merrion-sq., Dublin. Dep. £3 3s.

NO DATE.

Castleton, I.O.M.—Section headquarters and 1 battery for Territorial Army Association of the Isle of Man. A. J. Davidson, architect, 16-18, Athol-st., Douglas. Dep. £2 2s.

Evenwood.—Alterations and additions to 2 houses. William Watson, 2, Stones End.

Halifax Royal Infirmary.—2 additional storeys of nurses' bedrooms. Walsh, Wilkinson & Coutts, chartered architects and surveyors, 10, Harrison-rd.

Southampton C.B.—Demolition of brick-built chimney at Corporation Wharf, Chapel. S. G. Stanton, B.E. Dep. £1 1s.

Wells-next-the-Sea U.D.C.—12 non-parlour type houses and 4 bungalows, Northfield estate, Wells. T. Inglis Goldie (A.), chartered architect, Wells, Norfolk.

PAINTING, ELECTRIC LIGHTING, HEATING, &c.

JUNE 30.

†**Lancashire C.C.**—Electric light and power installation at new junior and infants' school, Farington. J. C. Prestwich & Sons, architects, Bradshawgate-chambs., Leigh. Dep. £2.

JULY 3.

†**Birmingham T.C.**—Installation of engineering services in connection with erection of extensions to stores block and porter's lodge at Dudley-rd. Hospital. E. S. Hoare & Partners, consulting engineers, Lancaster House, Newhall-st. Dep. £2 2s.

JULY 4.

†**Middlesbrough E.C.**—Alterations to electric lighting and power systems, Constantine Technical College. Director of Education.

JULY 5.

Birmingham T.C.—Installation of complete systems of heating, domestic hot-water supply, extensions to cold-water supply (town main), cold-water supply (tank main) and fire main at Marston Green Cottage Homes. H. J. Manzoni, City E. Dep. £2.

Bradford T.C.—Electrical installation to children's homes at Duckworth-ln. Acting City Architect.

Breconshire C.C.—Internal and external redecoration at various schools. H. C. W. Strickland (F.), County Architect, Watton Offices, Brecon.

Newport (Mon.) C.B.—External painting (part only), Mental Hospital, Caerleon. Borough Architect. Dep. £1 1s.

Nottinghamshire C.C.—Installation of gas services at children's homes, Basford. County Architect. Dep. £1 1s.

Pembrokeshire E.C.—Low-pressure hot water central heating installations in various schools. O. T. Thomas (L.), County Architect, Haverfordwest. Dep. £1 1s.

Reading C.B.—Redecoration and minor repairs at Reading school, Erleigh-rd. B.S. Dep. £1 1s.

Staffordshire C.C.—Heating and domestic hot water installations at senior girls' new council school, Knypersley, Biddulph, and senior (mixed) new council school, Kinver, Stourbridge. F. A. Hughes, Director of Education, Stafford. Dep. £2 2s. each.

York T.C.—Installation of heating services in greenhouses at Fulford Nurseries. Chas. J. Minter, City E.

JULY 6.

Chester T.C—Painting and decorating of assembly room at Town Hall. Charles Greenwood, City E. and S.

Cornwall C.C.—Heating and electrical installation, County Hall, Truro. County Architect, County Hall. Dep. £2 2s.

Dewsbury C.B.—Painting and decorating work at technical college. Borough Architect and Buildings Surveyor.

Dublin Corporation.—Painting works, small structural alterations, plumbing works and floor coverings at Buckingham-st. fire station. City Architect, 1/3, Parliament-st.

Hebburn U.D.C.—Painting and cleaning works to 481 houses. S.

Hoole U.D.C.—Exterior painting of 60 houses in Pine-gr. E. H. Rigby, C.

Tynemouth E. C.—Renewal of 3 floors at Western council school. Education Secretary, South Preston Villa, North Shields.

York T.C.—Taking-up and relaying 490 yd. super. of concrete floor at Cattle Market. C. J. Minter, City E.

JULY 7.

London (H.M.O.W.).—Covering with insulating material of steam mains, etc., at Bridgend royal ordnance factory, and heating and hot-water services at Farady-bldg., south block extension, E.C.4. Room 71, H.M.O.W., London, S.W.1. Dep. £1 (each contract).

Luton E.C.—Painting and decorating of interior and exterior of certain schools. B.E.

West Riding E.C.—Painting of Heckmondwike, South Hiendley, Ryhill, West Bretton and Mirfield Hopton council schools. F. R. Mann, 8, St. John's North, Wakefield.

JULY 8.

Dagenham T.C.—Reinforced concrete posts, erection approx. 2,300 lin. yds. of existing chain link fencing, supply and erection of approx. 170 lin. yds. of new chain link fencing and posts, etc., at Dagenham-rd., Dagenham. F. C. Lloyd, B.E. and S. Dep. £1 1s.

Gravesend T.C.—Repairs, redecorations and alterations to 5 schools. Borough Architect, 5, Woodville-ter.

Rhyndwyclydach P.C.—Paved area and shelter at Clydach swimming bath. W. R. Davies, C., 160, Swansea-rd., Trebanos, Pontardawe.

West Riding C.C.—Painting Goole Old Goole council, Swinefleet council, Stainforth Thorne-rd. council, Thorne council schools. E. L. Harrap, Education Offices, Goole.

Worthing T.C.—External painting and internal decorating at various schools. P. E. Harvey, school architect, Town Hall.

JULY 10.

Blackpool E.C.—Redecoration of various schools. Director of Education, Education Dept., Stanley-bldgs.

Blackpool C.B.—Removal of galleries at Devonshire-rd. junior girls' and infants' schools. Director of Education.

Breconshire C.C.—Electric light installation, Llangammarch Wells police station; electric light installation, Llanwrtyd Wells police station. H. C. W. Strickland, County Architect, Brecon.

Hemel Hempstead T.C.—School cleaning and repairs. A. Murray-Smith, School Architect, Market-sq.

Huddersfield C.B.—Painting and decorating work required in extensions to technical college, Queen-st. B.E. and S., High-st.-bldgs.

Poole T.C.—Painting day huts at Branksome Dene Chine and Sandbanks recreation ground. E. J. Goodacre, B.E. Dep. £1 1s.

Portsmouth T.C.—Demolition of ramparts, filling-in of moat at Hilsea, and cleaning, levelling, land drainage, etc. City E.

Sutton Coldfield T.C.—Internal and external painting and cleaning of various elementary schools. B.S.

Wood Green E.C.—Repairs to all council schools, and interior decorations of Noel Park, Alexandra and Lordship-ln. schools. R. H. Matthews, B.E. and S. Dep. £1 1s.

JULY 11.

Chatham T.C.—Re-tiling roofs, Luton-rd. C. schools. R. L. Honey, F.S.I., architect. Dep. £2 2s.

Fife C.C.—Sanitary improvements, Kilmany school. G. Sandilands, County Master of Works, County Offices, Wemyssfield, Kirkcaldy. Dep. £1 1s.

Flintshire E.C.—Internal and external painting and repairs of Rhyl County School, old premises, and Hawarden County School, old premises. R. G. Whitley (L.), County Architect and Surveyor, Mold.

West Hartlepool C.B.—Electrical installations in new transport garage, workshops and offices in Musgrave-st. A. R. Burton, Transport Manager, 67, Church-st. Dep. £5.

JULY 12.

Birkenhead C.B.—Heating, hot water supply, and extract ventilation in new workshops and garages at transport depot, Laird-st. Ernest Griffiths & Son, consulting engineers, The Temple, Dale-st., Liverpool. Dep. £5.

Chatteris U.D.C.—External painting of 78 houses. S. Hipwell, S., 19, New-rd.

Luton T.C.—Electrical installation, Luton Aerodrome, hangar extensions. B.E. Dep. £2 2s.

Northampton R.D.C.—Electrical wiring of 34 houses, and interior decoration and repair of 53 houses on Kerrfield estate, Duston. R. J. Miller, S., 1, Spencer-parade. Dep. £1 1s. (each contract).

West Riding C.C.—External painting and improvements to playing field, Sowerby Bridge secondary school. Lewis Rhodes, Clerk to Governors, Martins Bank-chams., Halifax.

JULY 13.

Ashton-in-Makerfield U.D.C.—Concrete fencing works at King George's playing field, off Armoury Bank. A. K. Dennis, S.

Clutton R.D.C.—Outside painting of 182 houses. E. H. Robbins, Farrington Gurney.

Finsbury B.C.—(a) Interior decoration, 144 flats, Margery-st. housing estate, W.C.1; (b) external painting, Royley House, Old-st., E.C.1. B.E.

Morley E.C.—Painting various schools. B.E.

JULY 14.

Liverpool.—Exterior painting, Alder Hey Hospital, Liverpool. City E. and S.

Winslow R.D.C.—External painting, etc., of 38 council houses. S.

JULY 15.

Bournemouth C.B.—Repairs and redecorations at certain schools. Education Office.

Bucklow R.D.C.—Electrical installations in 30 houses, Ackers-ln., Carrington. H. V. Shaw, E. and S., 26, Station-bldgs., Altrincham. Dep. £1 1s.

Consett U.D.C.—Installation of electric light into 246 council-owned houses. T. Hutton, E. and S.

Holywell U.D.C.—External painting of council houses on various sites. D. L. Morgans, Surveyor and Architect.

JULY 17.

Curdworth P.C.—Entrance gates and layout of King George's Field. G. Davies, C., Hurley, near Hatherstone.

Hull Corporation.—Electrical installation at Hopewell-rd. school, Bilton Grange Estate. City Architect. Dep. £1 1s.

Keighley E.C.—Internal and external painting and alterations to various schools. E. G. Felgate (A.), Borough Architect, College-st. Dep. £1.

Leeds T.C.—Painting Leeds Bridge, Monk Bridge over River Aire and Monk Bridge over canal, and various bridges J. E. Acfield, City E

West Riding C.C.—Electrical installation in connection with erection of Bingley modern school and technical institute. W. G. Newton & Partners, architects, 4, Raymond-bldgs., Gray's Inn, London, W.C.1.

JULY 20.

Morley E.C.—Various improvements at schools. B.E.

JULY 22.

***Rainhill C. Mental Hospital.**—Rubber tiling corridors, new admission hospital. T. Garner, 49, Corporation-st., St. Helens, Lancs. Dep. £2 2s.

JULY 25.

Newark T.C.—Installation of low-pressure heating system to municipal offices, Balderton Gate. John H. Clarke, B.S.

AUGUST 31.

Stretford T.C.—Interior repainting and redecorating of 184 houses. H. B. Poulton, Estates Manager, Town Hall.

MATERIALS, &c.

The materials for which tenders are invited normally include one or several of the following :—asphalt, bricks, brooms, building lime, cast-iron pipes, cement, concrete, kerbs, etc., concrete tubes, drain pipes, glazed stoneware pipes, granite chippings, granite kerbs, gravel, gulleys, lime, manhole covers, painters' materials, plumbers, materials, road stone, slates, stoneware pipes, sand, stone, tar, tarslag and bituminous macadam, timber, and whinstone screenings. Readers should obtain full particulars by personal inquiry.

JULY 7.

Barrow-in-Furness C.B.—Wallpapers. F. L. Wooldridge, B.E. and S.

JULY 8.

Raunds U.D.C.—G. Whittam, S.

JULY 11

***Flintshire E.C.**—Fixtures to stages for Rhyl, Hawarden, Holywell and Mold schools. R. G. Whitley (L.), County-bldgs., Mold.

Morley T.C.—B.E.

JULY 13.

***Dewsbury C.B.**—School furniture, Temple-rd. Snr. girls' school. Borough Architect and Buildings Surveyor.

JULY 17.

***Chatham E.C.**—School furniture, Highfield senior boys' school. Education Officer, Elm House, 15, New Road-av.

AUGUST 15.

India.—Roofing materials for Indian Stores Dept. (Dept. of Overseas Trade), 35, Old Queen-st., S.W.1. (T.Y. 19032/39.)

ENGINEERING, IRON AND STEEL.

JULY 5.

Monmouthshire C.C.—Reconstruction of footbridge at Llangiwa. C.S., "Stelivo," Bassaleg-rd., Newport (Mon.). Dep. £5.

JULY 6.

Cornwall C.C.—Steelwork (about 130 tons), extensions, County Hall, Truro. County Architect, County Hall. Dep. £2.

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15, North Audley Street, London, W.1.

Malden and Coombe T.C.—Reinforced concrete piles to support the various buildings to be constructed on site of new central depot, California-rd. A. R. Goldthorp, B.E.

Wilts C.C.—Reconstruction of Pewsey streets, and Pewsey Town Bridge. H. S. Ganderton, C.S., Trowbridge. Dep. £2.

JULY 7.

Lunesdale R.D.C.—Laying of water mains and reconstruction of reservoir including installation of chlorination plant on Hornby water scheme. A. R. Harlow, C. Dep. £1 1s.

Okehampton R.D.C.—For Exbourne water supply. Lemon & Blizard, consulting engineers, 24, Lockyer-st., Plymouth. Dep. £3 3s.

Stratford-upon-Avon R.D.C.—Reinforced concrete water tank at Binton. H. J. Weeks, S., 11, Guild-st.

JULY 8.

Alfreton U.D.C.—Water main at Lea, nr. Matlock. Elliott & Brown, consulting engineers, Burton-bldgs., Nottingham. Dep. £3 3s.

Ashbourne U.D.C.—Sewage works extension. W. Clifford, E., "Maycroft," Stourbridge-rd., Wombourne. Dep. £3 3s.

JULY 10.

Lancashire C.C.—Construction and completion of Longton bypass on Liverpool-Preston trunk road, from Four Lane Ends, Hoole, to existing roundabout near "Anchor Inn," Hutton, including construction of Brownhill railway bridge; widening and reconstruction of Green Man Canal bridge at Brock on Preston-Lancaster trunk road; widening and reconstruction of Mill-ln. railway bridge at Newton-in-Makerfield on Warrington-Wigan trunk road; construction of pedestrian subway at Swinton, on Liverpool-East Lancashire trunk road; and widening of Laneshaw county bridge, Colne, on Colne-Keighley county road. P. Schofield, County Surveyor and Bridgemaster, Preston. Deps. £5 5s. and £2.

West Suffolk C.C.—Mass concrete retaining wall and post and tube fencing at Hitcham. E. H. Bond, C.S., Bury St. Edmunds

JULY 11.

Argyll C.C.—Clearing, fencing, drainage, earthworks, bridges, culverts, walls, carriage and other works, on Cairndow-Dunoon-Toward-rd. — St. Catherine's-Loch Eck section (9 miles). D. C. MacTavish, Joint County Clerk, County Offices, Lochgilphead. Dep. £3 3s.

Essex C.C.—Reconstruction of Cockabourne Bridge, carrying Squirrels Heath-rd. (unclassified), Harold Wood. R. H. Buckley, C.S., Chelmsford. Dep. £2 2s.

Offaly County Board of Heath and Public Assistance.—Construction of seyerage system for Edenderry. Nicholas O'Dwyer, consulting engineer, 6, Burlington-rd., Dublin. Dep. £5 5s.

York T.C.—Reconstruction Heworth Green Bridge. C. J. Minter, City E. Dep. £1 1s.

JULY 12.

Cromarty Harbour.—Repairs to R.C. pier. Arch. Henderson, M.Inst.C.E., 21, Bridge-st., Aberdeen.

Kington (G.W.R.).—Reconstruction and widening of Sunset Bridge, near Kington Station, Herefordshire. Chief Engineer, Paddington Station, W.2. Dep. £2 2s.

JULY 13.

Bedfordshire C.C.—Widening of Elstow Bridge in brickwork, together with construction of approaches and other contingent works. C.S., Bedford. Dep. £2.

JULY 17.

Sligo Board of Health and Public Assistance.—For Inishcrone waterworks scheme. N. O'Dwyer, consulting engineer, 6, Burlington-rd., Dublin. Dep. £5 5s.

Wokingham R.D.C.—For Wokingham rural district main drainage, contract No. 3. Howard Humphreys & Sons, consulting engineers, 17, Victoria-st., Westminster. Dep. £10 10s.

JULY 21.

Maidenhead T.C.—Sewage disposal works and sewage pumping stations. Howard Humphreys & Sons, consulting engineers, 17, Victoria-st., Westminster. Dep. £10 10s.

JULY 24.

Middlesex C.C.—Contract No. E.D.1 for East Middlesex main drainage, Deephams sewage purification works, Montagne-rd., Edmonton, N.9. J. D. & D. M. Watson, engineers, 3, Central-bldgs. S.W.1. Dep. £5 5s.

South African Railways and Harbours Administration.—Approximately 273 tons of steelwork for bridges, including bolts, rivets, etc. Dept. of Overseas Trade, S.W.1. (Ref. T.22,981/1939.)

JULY 26.

West Bridgford U.D.C.—Sewage disposal works, contract No. 1. H. Carmichael, E. and S. Dep. £5.

JULY 27.

Caernarvon T.C.—3,500 lin. yds. of 9-in. to 15-in. dia. sewers, 600 lin. yds. of 18-in. to 36-in. dia. sewers, 200 lin. yds. of 27-in. dia. sea-outfall, 100 lin. yds. of 12-in. dia. sea-outfall, high steel beacon, pumping station, manholes and ancillary works, etc. J. D. & D. M. Watson, engineers, 3, Central-bldgs., Westminster, S.W.1. Dep. £5 5s.

East Suffolk C.C.—Construction of Bramford Bridge. C.S., Ipswich. Dep. £2.

JULY 31.

South African Railways and Harbours Administration.—Structural steelwork, etc., for 600-ton coaling plant, Pietersburg. Dept. of Overseas Trade S.W.1. (Ref. T.22886/39.)

AUGUST 10.

Port Elizabeth T.C.—For Kromme River water scheme. Davis & Soper, Ltd., London Agents, 54, St. Mary Axe, E.C.3.

ROAD, SEWERAGE AND WATER WORKS.

JULY 4.

†Birmingham T.C.—Lay-out of Fox Hollies Hall site, Fox Hollies-rd., Acocks Green. General Manager, Parks and Cemeteries Dept., 161, Corporation-st. Dep. £2 2s.

JULY 5.

Galashiels T.C.—Sewers and branch drains from 9-in. to 4-in. dia. and roads with bituminous macadam surfacing, on housing scheme, Gala Policies site, 2nd and 3rd developments. Carter & Wilson, civil engineer, 51, Queen-st., Edinburgh, 2. Dep. £2 2s.

Glamorgan C.C.—Bishopston—Caswell Bay county road and improvement between Pyle Corner and Caswell-rd. Corner. C.S., County Hall, Cardiff. Dep. £5.

Highworth R.D.C.—Water supply for parish of Castle Eaton. A. H. S. Waters, E., 25, Temple-row, Birmingham, 2. Dep. £3 3s.

Keighley T.C.—Making-up Florist-st. (part), back Colenso-rd., back Kirby-st. R. Courtenay Gibson, B.E. and S. Dep. £1 1s.

Liverpool T.C.—Paving, etc., to flats, St. Domingo-rd., second portion. Director of Housing, Blackburn-chambs., Dale-st., Kingsway. Dep. £1 1s.

Mansfield T.C.—Making-up of Big Barn-la. (part of), Firbeck-av., Firbeck-cres., Columbia-av. Waude Thompson. B.E. Dep. £1 1s.

Morecambe and Heysham T.C.—Making-up of 5 front streets and 2 back streets. B.S. Dep. 10s.

Rayleigh U.D.C.—Making-up King's-rd., Queen's-rd. (part of), and Broad Oak-way. E. and S. Dep. £2 2s.

JULY 6.

Bucks C.C.—Making-up and paving of Fassetts-rd., Loudwater. C.S., Aylesbury. Dep. £2.

Cardiff T.C.—Road and drainage works at Ely. City E.

Congleton T.C.—Making-up of Lower Heath-av. B.E. Dep. £2 2s.

Hoole U.D.C.—Tar spraying roads. E. H. Rigby, C.

Kilmarnock T.C.—Outfall sewer, Ruccarton. W. Dunbar, B.S., 17, Green-st.

Lichfield R.D.C.—Road, 375 yds. long, with concrete carriageway, also foul and surface-water sewers, at housing site at Shenstone Wood End. J. G. Rimand, E. and S. Dep. £2 2s.

Southend-on-Sea C.B.—Making-up of Blenheim-chase (section 3), Henley-cres., Midhurst-av. (section 1), and Marina-cl. R. G. Baxter, B.E. and S. Dep. £1 each street.

JULY 7.

Cheshire C.C.—Draining, levelling and other work necessary in connection with playing fields, frontages, gardens, etc., for Cheadle Broadway Council senior school. Director of Education, City-rd., Chester.

Forfar T.C.—Reconstruction of Castle-st., Brechin-rd., South-st. and St. James'-rd. B.S.

Gloucestershire C.C.—Street improvement works in Filton. C.S., Gloucester. Dep. £2 2s.

Newcastle-under-Lyme T.C.—Road, etc., improvements in Higherland, Newcastle; Porthill, Oaklands-av. to First-av.; Alexandra-rd. and Dimsdale-parade, Wolstanton. B.S. Dep. £2 each.

JULY 8.

Audenshaw U.D.C.—Private street works in Lynwood-gr. and Moss-st. H. M. Doxey, Ryecroft Hall. Dep. £2 2s.

Blackpool T.C.—Surface draining and formation of St. Andrew's-av. and 29 other streets. B.E. and S. Dep. £1.

East Riding C.C.—Road reconstruction and surfacing works, contract Nos. 15-24. C.S., Beverley.

Manchester T.C.—Draining, etc., Ogden-gr., Halstead-gr., High Crest-av., Charnwood-rd. and Connor-way, Northen Etchells. Highways Department (District Surveyor's Office). Dep. £1 1s.

West Suffolk C.C.—Approx. 6,864 yds. super. of concrete road along Cook's-dr., at West Row, Mildenhall, and approx. 3,570 yds. super. of concrete road along Undley-dr., at Undley Hall Farm, Lakenheath. C. F. Pattle, County Land Agent, Shire Hall, Bury St. Edmund's. Dep. £4 4s.

West Sussex C.C.—Making-up Orchard-av. (part), Lancing. C.S., Chichester. Dep. £1.

JULY 10.

Bridgwater T.C.—Construction of approx. 440 yds. lin. of tarred macadam roadway and flagged footpaths and 300 yds. of 9-in. dia. concrete sewer. R. A. Watson, B.E. Dep. £2 2s.

Erith T.C.—Making-up of Northumberland-cl. J. H. Clayton, B.E. and S. Dep. £1 1s.

Hayes and Harlington U.D.C.—Surface water sewer in Botwell-la. to Grand Union canal. E. and S. Dep. £5 5s.

Public Appointments.

JULY 3.

Herefordshire C.C.—Clerk of Works. Executive Officer, County Offices, Hertford.

L.C.C.—Instructor, S.E. London Technical Institute, S.E.4. Education Officer (T.1), County Hall, S.E.1.

Manchester University.—Assistant Lecturer. Registrar, College of Technology.

Norwich T.C.—Architectural Assistant (Temp.). City Architect, City Hall.

University of Liverpool.—Assistant. Registrar.

JULY 4.

Chepping Wycombe T.C.—Stores Costing Clerk. T.C.

JULY 5.

Dewsbury C.B.—Junior Architectural Assistant. Clerk of Works and Clerk of Works (temp.). M. H. Forward (A.), Town Hall.

Staffordshire C.C.—Two Architectural Assistants. K. L. Murray (F.), County Buildings, Stafford.

***Wolverhampton E.C.**—Heating Engineers. Director of Education, North-st.

JULY 7.

***Barking T.C.**—Architectural Assistant (Temp.). C. C. Shaw, Borough Architect.

Monmouthshire E.C.—Quantity Surveyor. Secretary for Education, County Hall, Newport.

JULY 8.

Southall B.C.—Architectural Assistant. B.E. and S.

Southampton C.C.—Junior Quantity Surveyor. County Architect, The Castle, Winchester.

JULY 10.

***London.**—Quantity Surveyor (temp.). Under-Secretary of State for War (C.4, Room 108), Whitehall, S.W.1.

***North Riding C.C.**—Clerk of Works. Secretary, Education Offices, County Hall, Northallerton.

JULY 11.

***Leicester T.C.**—Junior Architectural Assistant. City E. and S

***Rochdale C.B.**—Architectural Assistant (Temp.) B.S.

JULY 12.

***Swansea C.B.**—Assistant Quantity Surveyor. T.C.

***Worcester T.C.**—General Clerk of Works. T.C.

JULY 15.

***Leeds T.C.**—Chief Architectural Assistant. R. A. H. Livett (A.), 26, Great George-st.

Paisley Technical College.—Lecturer. J. & A. Gardner, Secretaries, 3, County Place.

JULY 17.

***Middlesbrough E.C.**—Assistant Clerk of Works. Director of Education, Education Offices.

NO DATE.

***Cheltenham B.C.**—Assistant Building Inspector. B. and Water Engineer.

***L.C.C.**—Chief Instructor (temp.) Architect, County Hall, Westminster Bridge, S.E.1.

***London.**—Assistant Quantity Surveyors. Civil Engineer-in-Chief, Admiralty, S.W.1.

***London.**—Civilian Quantity Surveyor (temp.). C.R.E., Colchester and 4th Division, Flagstaff-rd., Colchester.

***London.**—Quantity Surveyors. The Chief Engineer, Western Command Headquarters, Queen's Park, Chester.

***London.**—Two Assistant Quantity Surveyors (temp.). C.R.E., London District, Horse Guards, Whitehall, S.W.1.

***Stepney B.C.**—Four Engineering and Four Technical Assistants. B.E. and S. Raine-st., E.1.

BUILDING ILLUSTRATED

PRESTATYN HOLIDAY CAMP.

The general contractors for this scheme (designed by Mr. William H. Hamlyn, F.R.I.B.A., architect to the London Midland and Scottish Railway) were Messrs. McLaughlin and Harvey, Ltd., of London. The principal sub-contractors were: Steelwork, Redpath Brown and Co., Ltd., and Head, Wrightson and Co., Ltd.; electrical work, the General Electric Co., Ltd.; hot and cold water, R. W. Steel and Co., Ltd.; filtration plant, United Filters and Engineering, Ltd.; softening plant, the Becco Engineering Co., Ltd.; tennis courts, W. H. Gaze and Sons, Ltd.; metal windows, the Rustproof Metal Window Co., Ltd.; swimming pool, Bradford and Co., Ltd.; loud-speakers, Tannoy Products; sanitary fittings, Musgraves (Liverpool), Ltd., and Rownson, Drew and Clydesdale; kitchen equipment, Benham and Sons, Ltd., and the Carron Co.; fencing, the Fernden Fencing and Construction Co., Ltd.; sewage and storm water pumps, Burn Bros. (London), Ltd.; signs, Dales; metal turrets and pressed steel fascias, Lund-Signs; maple flooring, R. W. Brooke and Co., Ltd.; patent glazing, Williams and Williams, Ltd.; patent ceiling construction and ceiling boards, C. F. Anderson and Son, Ltd.; flush doors, R. Cattle, Ltd.; folding and sliding doors, Esavian Doors; roof coverings, the Ruberoid Co., Ltd., and D. Anderson and Son, Ltd.; ventilation, the Lipscombe Air-Conditioning Co., Ltd.; boiler chimney, steam boilers, J. B. Hickey and Sons; wardrobes, bar tables, lounge tables, bar chairs, lounge chairs, settees, showcases (specially made to architect's design), B. Cohen and Sons, Ltd.; deck chairs, garden umbrellas, garden tables, park chairs and benches, John Hawley and Co. (Walsall), Ltd.; folding camp chairs, the "X" Chair Patents Co., Ltd.; office furniture, Edgley's, Ltd.; lettering (to architect's design), Kings Signs, Ltd.; cloakroom fittings, James Sieber; "Wellinlith" material, Wellinlith, Ltd.; fibrous plaster, W. A. Telling, Ltd.; ventilators, G. A. Harvey and Co. (London), Ltd.; entrance pylons, Fred Braby and Co., Ltd.; trucks, H. C. Slingsby; cables, Messrs. Pirelli; wiring, Rashleigh Phipps, Ltd.; electric light fittings, Major Equipment Co.; neon signs, Ionite, Ltd.; lamp standards, Concrete Utilities; pipes, Crane and Co.; calorifiers, Lumbys, Ltd.

TRADE NEWS

An Announcement.

Mr. G. H. C. Ratcliffe, a managing director of the London Brick Company, Ltd., is shortly leaving this country to settle in South Africa, where he has family and other interests. Accordingly he has resigned his directorship of the company.

Imperial Airways New Headquarters.

With reference to the Imperial Airways new headquarters, illustrated in our issue of June 16, we are informed that G.V.D. Illuminators were responsible for the lighting in the main booking hall, stairway leading to restaurant, mezzanine galleries, and telephone kiosks.

Housing Development for Guinness Trust, Loughborough Park.

In connection with the above, which was illustrated in our issue of June 16, we are informed that the majority of the precast concrete stairs were supplied by Messrs. Malcolm Macleod and Co., Ltd., Glen-road, Walthamstow, E.17.

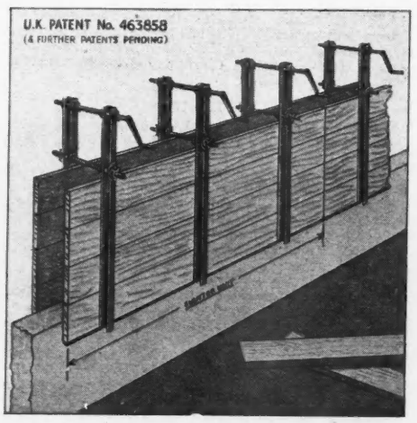
Central Cleansing and Transport Depot. Westminster.

In connection with the Central Cleansing and Transport Depot, Westminster, which has been awarded the London Architecture Medal, we are asked to state that Messrs. Cellactite and British Uralite, Ltd., supplied "Cellactite" roofing and ventilators for the building. Cellactite is an asbestos-protected corrugated metal, which is claimed to combine the strength of steel with complete freedom from upkeep cost. The architect for the Central Cleansing and Transport Depot is Mr. G. Grey Wornum, F.R.I.B.A.

An Adjustable Steel Wall Clamp.

An all-steel device designed to enable the same wall shutter-boards to be used over and over again, thus disposing of intermediate labour costs in cutting, jointing and nailing, is announced by Messrs. Acrow (Engineers), Ltd., 18-21, Charterhouse-square, E.C.1. The device is known as the Acrow Adjustable Steel Wall Clamp and is claimed to reduce timber costs by 75 per cent. and labour costs in shuttering by 50 per cent.

The shutter boards are made in 7 to 8 ft. lengths in lifts up to 3 ft., and secured by screws to three shutter clamps as shown. The base of the wall is built in the ordinary way to a height of 6 in. or so, and the shutter unit fixed to the base so built by adjusting to the required thickness by means of the lower screws and then finally fixing by means of the upper (the clamping) screws. When the required lift has been concreted and set, unscrewing of the clamping screws releases the shutters on both sides of the wall, when the entire unit may be lifted to its new position and reclamped. The bottom screws remain untouched unless a different thickness is required. It is claimed that concrete vibrators may be used with assurance that the shutter-boards will remain securely fixed in position. The clamps are entirely self-contained, with no loose parts.



ADJUSTABLE STEEL WALL CLAMP (See above).

CURRENT AND PROPOSED BUILDING WORK *

The Editor welcomes authentic information for this feature from architects, surveyors or contractors. Where business representatives cannot be seen personally at this stage, this should be mentioned. Items should reach 4, Catherine-street, Aldwych, W.C. not later than Wednesday morning.

Acton.—T.C. approved: Additions to factory, 26, Chase-rd., for Acton Bolt & Fine Threads, Ltd., Chase-rd., N.W.10; alterations, rear of 39, Agnes-rd., for Stewart & Ardern, Ltd.; alterations and additions, Horn-ln., for Meyers Bros., and additions, Park Royal-rd., for Metal Mouldings, Ltd. Percy Pratt & Blount, 174, High-st., W.3, architects for both schemes.

Adwick-le-Street.—M.H. approved plans for Council offices, Village-st., for U.D.C. Estimated cost, £16,000. Architects, Shapley & Davison (AA.), 22, Queen-sq., Leeds.

Antrim.—C.C. approved: New technical schools at Ballyclare. Cost £19,245.

Backworth.—R. Burke, Singleton House, Newcastle, architect for R.C. school.

Bingley.—Rev. J. Hawkswell, P.P., Church of Sacred Heart, Crownest-rd., proposes church at Crossflats between Morley-av. and Moorview. Architect, J. H. Langtree-Langton, 2, Cheapside, Bradford. Estimated cost, £3,000.

Bishop's Stortford.—Plans by Tooley & Foster, Midland Bank-chambs., Buckhurst Hill, for Roman Catholic school. No contracts placed.

Blyth.—Dixon & Son, 1, Collingwood-st., Newcastle, architects for social club and institute. No contracts let.

Bridgnorth.—Managers of C.E. schools propose senior school. Plans by W. E. E. Anderson (L.), 12, Imperial-sq., Cheltenham.

Bromley T.C. approved: S. C. Macey's 16 flats, Glebe Knoll, Beckenham-la.; E. Tyler, 16 houses in new road off Southborough-la.

Burradon.—Social club and institute to be built. Dixon & Son, 1, Collingwood-st., Newcastle, architects.

Bury.—T.C. approved: Meeting hall at junction of Queen's-rd. and West-rd.

Caernarvon.—Williams & Williams, builders, propose 67 houses at Llys Meirion and Cae Gwyn estates.

Chester.—D. A. Beveridge, architect, 36, Dale-st., Liverpool, 2, preparing plans for petrol filling station and garage, Pepper-st., for Grosvenor Motor Co., Ltd., Foregate-st.

Chesterfield.—F. W. Tempest (F.), Regent-st., Mansfield, architect for extensions to Sunday school, North-rd., Clowne, for Trustees.

Chesterfield.—T.C. approved: Extension to warehouse, Portland-wks., Central-av., for Robinson & Sons, Ltd.; lay-out of new streets, Broomfield estate, for W. Heathcote.

Clay Cross.—Committee of Brotherhood and Y.M.C.A. propose assembly hall and institute, at £7,000.

Coventry.—New church hall to be erected on site of present St. Mary Magdalen's Hall in Sir Thomas White's-rd. Architect, N. F. Cachemaille-Day (F.), London, N.W.1. Cost, £2,800.

Croxley Green.—Herts Territorial Army and Air Force Association, Hertford, to build drill hall, armoury, etc. Plans by H. G. Cherry (F.), 36, Gordon-sq., W.C.1. Northcroft, Nicholson & Neighbour, quantity surveyors, 26, Bloomsbury-way, W.C.1.

Dartford.—T.C. approved:—Alterations and additions to superintendent's quarters, Dartford police station, Highfield-rd., Kent C.C.; sports pavilion rear of Burnham-rd., Dartford Technical College.

Durham.—W. & T. R. Milburn, 17, Fawcett-st., Sunderland, architects for extensive alterations and additions to "Eden Arms," Rushford.

Ealing.—T.C. to obtain tenders for strengthening portion of Copley Dene electricity sub-station, which is to be used as main report centre for A.R.P.—Plans passed: Office and lavatory block to coach garage, for G. R. Valli (architect, R. Ward, 33, St. George's-rd., S.W.); additions to pharmaceutical laboratory, for J. Nathan & Co., Ltd. (architect, Wallis, Gilbert & Ptnrs., 15, Elizabeth-st., S.W.1); 24 flats, Ruislip-rd., B.C.M. Estates & Contractors, Ltd., 235, The Broadway, Southall; 26 houses, Parkfield-rd., C. W. & W. Harding, Ltd. (architect, S. H. West, 18, Central-chambs., W.5).

Gravesend.—Watney, Combe, Reid & Co., Ltd., Stag Brewery, S.W.1, to rebuild "Bat and Ball" p.h., Wrotham-rd. Nowell Parr & Son, architects, 97, Old Brompton-rd., South Kensington, S.W.7. E. Spriggs & Partners, quantity surveyors, 97, Old Brompton-rd., S.W.7.

Halesowen.—T.C. approved: Infant welfare centre at Long-ln., Cakemore, for Worcestershire C.C.

Hitchin.—Extensions to be made to North Herts and South Beds Hospital, to cost about £35,000. Plans by S. B. Russell (F.), The Churchyard. W. C. Moore, Q.S., Devereux-bldgs., Devereux-court, W.C.2.

*See also List of Contracts Open.

****In these lists every care is taken to ensure that information given is accurate and up to date, but it may occasionally happen that, owing to building owners taking the responsibility of commencing work before plans are finally approved by the local authorities, "proposed" works at the time of publication have been actually commenced. List of abbreviations on page 1239.**

Jarrow-on-Tyne.—G. C. Young, 12, Grange-rd. West, prepared plans for additions to Masonic lodge, Grange-rd.

Kensington.—B.C. approved:—Rear of 92, Holland Park-av. to abut on Lansdowne-mews, two-storey house; 129 and 131, Warwick-rd. and 1, 3 and 5, Fenelon-rd ("Royal Arms" p.h.), new public-house building; 120-216, Wornington-rd.; 6 blocks of working-class flats; 11-26, Royal-cres.-mews, 40 lock-up garages; rear of 116-156, Cromwell-rd. (over Metropolitan and District Railway line), block of flats, shops, garage, restaurant, etc.; 1-8, Onslow-gdns., block of 8 houses; 15 and 17, Holland-st., library building abutting on Kensington Church-walk.

Keswick.—Cumberland Pencil Co. to erect three-floor mill and timber-treatment building. Plans by P. M. Hope (L.).

Knowle.—New store on site of "Swan Inn." Warwick-rd., for G. J. Mason, Ltd. Ewen Harper, Brother & Co., architects.

Leamington Spa.—T.C. approved: 34 semi-detached houses with garages, Epsom-rd., and road No. 3, Village Farm estate, Lillington, for Lewis & Watters, rebuilding of "Windmill Inn," Tachbrook-rd., for P. Phipps & Co., Ltd.

Letchworth.—Proposed technical college, for Hertfordshire C.C. Architect, T. E. Scott (F.), 2, Gray's Inn-sq., W.C.1.

Lindsey.—C.C. to widen a two-mile section of Lincoln-Skegness road, at £60,000.

Liverpool.—Bowring Park Estate, Ltd., 31, Dale-st., propose ten shops, etc., junction of Rimmer-av., Bowring Park-av., and Broadgreen-rd., Roby. Architects, Brown & Sanders, 31, Dale-st.

Liverpool.—Littlewood's propose mail order stores in Clayton-sq. Cost, £250,000.

London (M.W.B.).—Board recommend £288 for alterations, repairs and renewal to lifts at head offices, and new laboratories; £206 repairing wooden fence, iron railings, gates and doors, etc., and repointing brick wall, Maiden-ln. reservoir; £300, redecoration of offices at Lee Bridge works.

London (City) Corporation recommend: alterations to store in Pudding-la., at £775.—Council to rebuild upper portions of front walls of 265, 267 and 269, Southwark Bridge-rd., at £155.—Application by Ley, Colbeck & Partners, on behalf of S. Brown & Sons (General Warehousemen), Ltd., for subway beneath public-way of Hanover Court, connecting 3 and 4 and 5, 7 and 7, Houndsditch, recommended.

Manchester.—Wilbraham Building Co., 17a, Church-rd., Urmston, propose 21 houses, French Barn-la., Blackley.—Howard & Clarke, builders, Abbey Hey-la., Gorton, propose 44 houses, Abbey Hey-la., Gorton. Architect, P. C. Kelvey, 379, Moss-la. East.—Greenwood & Tyson, Victoria estate, Rochdale-rd., Blackley, propose 106 houses. Victoria-av. East, Blackley. Architect, P. G. Kelvey, 379, Moss-la. East.

Market Drayton.—M.W.M. Maisonettes, 40, Pall Mall, London, S.W.1, prepared plans for 100 houses, etc., at Dale Lands.

Middlesbrough.—T.C. approved: Alterations and additions, Whitehouse Garage, Longlands-rd., corner Ormesby-rd., for Whitehouse Garage; school, Stockton, Connaught and Dunstable-rds., for Trustees of R.C. school; alterations and additions to warehouse, Simpson-st., for R. Collins.

Middlesbrough.—W. E. Haslock, 143, Albert-rd., prepared plans for warehouse and garage, Trunk-rd., for A. Dowson.—Dean Bros., builders, Marton-rd., to develop estate near St. Mary's-walk, providing for 159 houses.—Plans approved: C. S. Errington, 46, Grainger-st., Newcastle-on-Tyne, prepared plans for social institute, Tranter-rd., for Sutton Dwellings Trust.

Morley.—T.C. approved: Drill hall at Bruntcliffe-la., for West Riding County Territorial Association, St. Leonards, York.

Nantwich (Cheshire).—Nantwich Joint Hospital Board, 14, Barker-st., propose additional wards to scarlet fever and diphtheria blocks at isolation hospital at Alvaston. Bower & Edleston (A.), architects, Bank-chambs.

Newcastle (Staffs).—Parochial Council of St. Michael and All Angels propose new church. G. Forsyth Lawson, architect, Lincoln-chambs., Market-pl., Banbury.—S. A. Wilmott, architect, Bourneville Estate Office, Birmingham, prepared plans for central fire station and houses for officers and men in Lower Mill House-ln.

Newcastle-on-Tyne.—Tenders to be obtained shortly for new Christian Science church in Osborne-rd. Architects, Fennell & Co., 16, West-st., Gateshead.

Ormskirk.—E. R. Jones, builder, 99, Great George-st., Liverpool, proposes 300 houses and shopping centre at Melling, nr. Ormskirk.

Orpington.—U.D.C. approved: four pavilions and first-aid posts in recreation grounds, Biggin Hill, Goddington Park, Petts Wood and St. Mary Cray, and three pavilions in recreation grounds at Cadham, Green-Street-Green and Farnborough; disinfector building and A.R.P. store at Council Offices depot, Orpington.

Ossett.—T.C. approved: Reconstruction "Cock and Bottle" Inn, Bank-st., John Smith's Tadcaster Breweries; 18 houses off Pildacre-ln., Westbourne Construction Co., Ltd.

Penn (Bucks).—The Invalid Children's Aid Association, 117, Piccadilly, W.1, to build convalescent home at £10,000. Ferneaux-Jordan & Handisyde, architects, 7, Gower-st., W.C.1.

Portsmouth.—T.C. approved: Portsmouth and Brighton United Brewery, Ltd., rebuilding the "Thurlow Arms" p.h., 261, Arundel-st.; Barnes & Eliot, for Howard Morris & Crocker, rebuilding second storey, 18, Palmerston-rd.

Preston.—W. C. Mangan (F.), 18, Guildhall-st., architect, for senior school for 160 scholars, off Cadley Causeway, Fulwood, for Very Rev. Canon J. L. Prescott, P.P. Church of St. Augustine Apostle of England, St. Austin's-pl. and Catholic Authorities.

Reading.—Prudential Assurance Co., Ltd., Holborn Bars, E.C.1, to build block of offices, etc., at 16-18, Friar-st. Plans by company's estate dept.

Ryton-on-Dunsmore.—Roote's Securities, Ltd., to build a factory and stores. Plans by Howard & Souster, 81, Piccadilly, W.1.

Sheffield.—Rev. R. Roseveare, P.P., of St. Cecilia's Church, proposes church hall, gymnasium, club-rooms, etc., Parson Cross estate, at £6,000.

Shrewsbury.—M.H. proposes emergency hospital, providing for 400 beds in huts ments near Salop Mental Hospital.

Slough.—T.C. approved:—G. P. Townsend, proposed layout off Woodland-av.; Manor Park Construction Co., Ltd., proposed layout, Priory estate, Burnham; International Alloys, Ltd., furnace room, rear building, 2, Buckingham-av.; Aspro, Ltd., bowls pavilion (revised plan), Bath-rd. (West); T. B. Williams, Ltd., 2 shops and living accommodation (revised plan), Stoke-rd.

Southport.—Rev. A. Dixon, The Vicarage, St. John's, Ainsdale, proposes church. Cost, £10,000.

South Shields.—T.C. approved: E.C. alterations to High School for Girls, Iolanthe-ter. F. W. Newby, for Henderson Bros. (1936), Ltd., extension to workshop at Smith-st. and Anderson-st.

Stourport.—U.D.C. approved plans: 60 houses off Bewdley-rd. North, for H. Matthews.

Stratford-upon-Avon.—T.C. approved plans for 17 shops, each with a flat over, junction of Evesham-rd. and Shottery-rd., for Hartwell Estate.

Stroud.—R.D.C. approved plans for 107 new houses at Stonehouse.

Sunderland.—Matkin & Hawkins, Barclays Bank-chambs., Fawcett-st., appointed architects for reconstruction of part of Ditchburn's cabinet works destroyed by fire recently.—Rev. H. Talbot, 5, Humbledon-pk., promoter of plan for mission church, Springwell Farm estate.—Tenders to be obtained for alterations to "Nutwith" hotel, Coronation-st., and "Salutation" hotel, Hendon-rd. Architect, E. M. Lawson, Barras-bldgs., Barras-bridge, Newcastle-on-Tyne.

Swansea.—C.B. resolved that the Borough Architect's estimate of £180 for provision of decontamination centre at Central police station be accepted.—Council approved laying out site, fencing, store shed, shelter, tools, plant, etc., depot at Bonymaen, £525, and same at depot at Clydach, £200.—Plans passed: H.M. workshop and store, Ebenezer-st., for Estateways, Ltd.; schoolroom, Port Tennant-rd., for Trustees of Port Tennant Road Hall; alterations and additions, 6, Oxford-st., for Central Commercial Properties, Ltd.

Taunton.—T.C. approved:—24 houses, Eastwick-rd., for F. C. Spear, Ltd.

Tenterden.—Plans prepared by Burgess, Holden & Watson, Station-approach, Beaconsfield, for restoration of Wesley House, Rolvenden.

Urmston.—U.D.C. approved: 24 detached houses off Ullswater-rd., Davyhulme, J. Maffinders & Sons, Ltd., 85, Derbyshire-la., Stretford; additions to works and transformer, Tenax-rd., Trafford Park, for Geigy Colour Co., Ltd.; extensions to works, Tenax-rd., Trafford Park, Trafford Park Steel Warehouse Co., Ltd.

Wakefield.—T.C. approved: L. Holdsworth, new bay window at "Breydon House," Chevet-la., for Mr. J. Holdsworth; W. H. Ogden, estate layout of 34 houses, Lawefield-la., 4 houses in Lawefield-la., for A. Squire; Simpson & Moxon, new Flanshaw hotel, Flanshaw-la., for Beverley Bros.; new Griffin hotel, new-st. off Northgate, for Beverley Bros.; rebuilding "Angel" hotel, Wood-st., for John Smith's Tadcaster Brewery Co., Ltd.

Walsall.—5th Batt. South Staffordshire Regiment propose drill hall at junction of Sutton-rd. and Springhill-rd.—Rev. A. Fraser, vicar, and Parochial Council propose parochial hall, Delves estate, at £3,000.

Warrington.—T.C. approved plans: Alterations to branch premises, Padgate-la. and Oakwood-av., Warrington Co-operative Society, Ltd., Cairo-st.; offices, Wilderspool Brewery, Greenall, Whitley & Co., Ltd.

Wellingborough.—R.D.C. approved plans: Additional factory and air raid shelter, Little Irchester, for Whitworth Bros.

Welwyn Garden City.—T.C. approved revised plans for sports pavilion, Hatfield Hyde playing fields. Cost about £5,500. A. Marshall Mackenzie & Sons (FF.), architects, 39, Maddox-st., W.1. R. E. N. Lowe, quantity surveyor, 82, Victoria-st., S.W.1.

Welwyn Garden City.—Welwyn Garden City, Ltd., proposes three-storey block of shops and flats in Freherne-rd. and Stonehills. Plans by Louis de Soissons (F.), Blue Ball-yd., St. James's-st., S.W.1. No contracts placed.

Westminster.—City Corporation approved interim development schemes:—16, Grafton-st., rebuilding and connection to 165, New Bond-st.; 33-48, Princes-gdns., dwelling-houses; 4, 5 and 6, Soho-sq. and Dean-st., showrooms and offices with air raid shelter in basement; Marsham-st. and Vincent-st. (corner), offices; 27, Berkeley-sq., conversion; Garrick Theatre site, Charing Cross-rd., offices; 2, Audley-sq., three-storey building in rear; 71 to 78, Petty France, offices and basement garage.

Wigan.—Midland Bank, Ltd., Poultry, London, E.C.2, proposes structural alterations to branch bank on Wallgate. Architects, Whinney, Son & Austen Hall, 37, Norfolk-st., Strand, London, W.C.2.

Woking.—U.D.C. approved: 3 shops with dwellings over, and 24 semi-detached houses opposite the "King's Head" hotel, Chertsey-rd., for H. Miller & Co.

Wolverhampton.—Holt Brewery Co., Ltd., Holt-st., Birmingham, propose licensed premises, junction of Penn-rd. and Mount-rd.

Wolverhampton.—T.C. approved: Henry Meadows, Ltd., Park-ln., extensions to offices; W. Whittingham, Ltd., Rake Gate Farm estate, 50 houses.

York.—Halifax Building Society, Ltd., Commercial-st., Halifax, propose office buildings, Doggate. Architects, Penty & Thompson, 32, Coney-st.

RATES OF WAGES IN THE BUILDING TRADE

AS AND FROM 1st FEBRUARY, 1939

[Every endeavour is made to ensure accuracy, but we cannot be responsible for errors]

	Crafts-men.	Lab-ourers.
Aberavon	1/7½	1/2¾
Aberdare	1/7½	1/2¾
Abergavenny	1/7	1/2½
Abingdon	1/6	1/1½
Accrington	1/7½	1/2¾
Aldeburgh	1/4	1/0
Aldershot	1/6	1/1½
Alfreton	1/7½	1/2¾
Alnwick	1/7	1/2½
Altrincham	1/7½	1/2¾
Amble	1/7	1/2½
Amersham	1/6	1/1½
Ammanford	1/7½	1/2¾
Andover	1/5½	1/1¼
Ardingley	1/5½	1/1¼
Arundel	1/5½	1/1½
Ascot	1/5½	1/1½
Ashby-de-la-Zouch	1/6	1/1½
Ashford (Kent)	1/5½	1/1¼
Ashford(Middlesex)	1/7½	1/2¾
Ashington	1/7	1/2½
Ashtead	1/7½	1/2¾
Ashton-under-Lyme	1/7½	1/2¾
Aylesbury	1/5½	1/1½
Aylsham	1/4½	1/0½
Bagshot	1/5½	1/1½
Banbury	1/5½	1/1½
Barnsley	1/7½	1/2¾
Barnstaple	1/5½	1/1½
Barrow-in-Furness	1/7½	1/2¾
Barry	1/7½	1/2¾
Basingstoke	1/5½	1/1½
Bath	1/7	1/2½
Batley	1/7½	1/2¾
Beaconsfield	1/6	1/1½
Beccles	1/4	1/0
Bedford	1/7	1/2½
Berkhamsted	1/5½	1/1½
Berwick	1/7	1/2½
Beverley	1/7½	1/2¾
Bexhill-on-Sea	1/6	1/1½
Bideford	1/5½	1/1½
Biggleswade	1/5	1/0¾
Billericay	1/5	1/0¾
Birchington	1/5½	1/1¾
Birkenhead	‡§1/10	¶
Birmingham	1/7½	1/2¾
Bishop Auckland	1/7½	1/2¾
Bishops Stortford	1/6½	1/2
Blackburn	1/7½	1/2¾
Blackpool	1/7½	1/2¾
Blyth	1/7½	1/2¾
Bognor Regis	1/5½	1/1¾
Bolton	1/7½	1/2¾
Bournemouth	1/6½	1/2
Bracknell	1/5½	1/1¼
Bradford	1/7½	1/2¾
Bradford-on-Avon	1/4½*	1/0½
Braintree	1/5½	1/1¼
Brentwood	1/7	1/2½
Bridgwater	1/6	1/1½
Bridlington	1/7	1/2½
Brighouse	1/7½	1/2¾
Brighton	1/6½	1/2
Bristol	1/7½	1/2¾
Broadstairs	1/5½	1/1¼
Bromsgrove	1/7	1/2½
Buckley	1/7½	1/2¾
Bungay	1/3½	11¾
Burnham-on-Crouch	1/4	1/0
Burnley	1/7½	1/2¾
Burslem	1/7½	1/2¾
Burton-on-Trent	1/7½	1/2¾
Bury	1/7½	1/2¾
Bury St. Edmunds	1/5	1/0¾
Buxton	1/7	1/2½
Byfleet	1/6	1/1½
Cambridge	1/7	1/2¼
Canterbury	1/5½	1/1¾
Cardiff	1/7½	1/2¾
Carlisle	1/7½	1/2¾
Carnforth	1/7½	1/2¾
Castleford	1/7½	1/2¾
Caterham	1/7½	1/2¾
Chard	1/4½*	1/0½
Chatham	1/6½	1/2
Chelmsford	1/7	1/2¼
Cheltenham	1/6½	1/2
Chepstow	1/6½	1/2
Chertsey	1/6½	1/2
Chester	1/7½	1/2¾
Chesterfield	1/7½	1/2¾
Chichester	1/5½	1/1¾
Chorley	1/7½	1/2¾
Cirencester	1/5*	1/0¾
Clacton	1/5½	1/1½
Cleveleys	1/7½	1/2¾
Clitheroe	1/7½	1/2¾
Cobham (Surrey)	1/6½	1/2
Colchester	1/7	1/2¼
Colwyn Bay	1/6½	1/2
Congleton	1/7	1/2½
Coventry	1/7½	1/2¾
Cranbrook	1/5½	1/1¾
Cranleigh	1/5½	1/1¾
Crawley	1/5½	1/1¾
Crewe	1/7	1/2½
Cromer	1/4½	1/0½
Crowborough	1/5½	1/1¾
Cuckfield	1/5½	1/1½
Darlington	1/7½	1/2¾
Darwen	1/7½	1/2¾
Daventry	1/6	1/1½
Deal	1/5½	1/1½
Denbigh	1/6	1/1½
Derby	1/7½	1/2¾
Devizes	1/4*	1/0
Dewsbury	1/7½	1/2¾
Didcot	1/5½	1/1½
Diss	1/4	1/0
Doncaster	1/7½	1/2¾
Dorchester	1/5*	1/0¾
Dorking	1/6	1/1½
Dover	1/5½	1/1½
Dovercourt	1/5½	1/1½
Driffield	1/6	1/1½
Droitwich	1/7	1/2½
Dudley	1/7	1/2¾
Dunstable	1/6	1/1½
Durham City	1/7½	1/2¾
Eastbourne	1/6½	1/2
E. Glam. (Mon. Val.)	1/7½	1/2¾
East Grinstead	1/5½	1/1½
Edenbridge	1/5½	1/1½
Ely	1/4	1/0
Epping	1/7½	1/2¾
Exeter	1/7†	1/2½
Exmouth	1/6	1/1½
Fakenham	1/4½	1/0½
Falmouth	1/6	1/1½
Fareham	1/6½	1/2
Faversham	1/5½	1/1¾
Felixstowe	1/6½	1/2
Filey	1/6	1/1½
Fleetwood	1/7½	1/2¾
Flint	1/7½	1/2¾
Folkestone	1/5½	1/1¾
Frinton-on-Sea	1/5½	1/1½
Frome	1/4½*	1/0½
Gainsborough	1/6½	1/2
Gateshead	1/7½	1/2¾
Gillingham (Kent)	1/6½	1/2
Glossop	1/7½	1/2¾
Gloucester	1/7†	1/2¾
Godalming	1/5½	1/1½
Goole	1/7½	1/2¾
Gosport	1/7	1/2¼
Grantham	1/6½	1/2
Gravesend	1/7	1/2½
Great Yarmouth	1/5½	1/1½
Grimsby	1/7½	1/2¾
Guildford	1/5½	1/1½
Guilsborough	1/6	1/1½
Halifax	1/7½	1/2¾
Hanley	1/7½	1/2¾
Harpenden	1/6½	1/2
Harrogate	1/7½	1/2¾
Hartlepools	1/7½	1/2¾
Harwich	1/5½	1/1¾
Haslemere	1/5½	1/1¾
Hastings	1/5½	1/1½
Hatfield	1/7	1/2¼
Haywards Heath	1/5½	1/1¾
Hednesford	1/7	1/2½
Hemel Hempstead	1/6½	1/2
Henley-on-Thames	1/5½	1/1½
Hereford	1/5½*	1/1¾
Herne Bay	1/5½	1/1½
Hertford	1/7	1/2½
Heysham	1/7½	1/2¾
Hitchin	1/6	1/1½
Hoddesdon	1/7	1/2½
Holt (Norfolk)	1/4	1/0
Horley	1/5½	1/1½
Horsham	1/5½	1/1½
Horwich	1/7½	1/2¾
Huddersfield	1/7½	1/2¾
Hull	1/7½	1/2¾
Hunstanton	1/4½	1/0½
Huntingdon	1/5	1/0¾
Ilfracombe	1/5½	1/1½
Ingatestone	1/6	1/1½
Ipswich	1/7	1/2½
Isle of Thanet	1/5½	1/1½
Isle of Wight	1/4½	1/0½
Keighley	1/7½	1/2¾
Kenilworth	1/7½	1/2¾
Kettering	1/7	1/2½
Kidderminster	1/7	1/2½
King's Lynn	1/5½	1/1½
Kirkham	1/7½	1/2¾
Knowle	1/7	1/2½
Lancaster	1/7½	1/2¾
Leamington	1/7½	1/2¾
Leatherhead	1/6½	1/2
Leeds	1/7½	1/2¾
Leicester	1/7½	1/2¾
Leighton Buzzard	1/4½	1/0½
Letchworth	1/6	1/1½
Lewes	1/5½	1/1½
Lichfield	1/6½	1/2
Lincoln	1/7½	1/2¾
Littlehampton	1/5½	1/1½
Liverpool	‡§1/10	¶
Llandudno	1/6½	1/2
Llanelly	1/7½	1/2¾
London—		
12 m. radius	1/9*	1/3¾
12-15 m. radius	1/8½*	1/3¾
Long Eaton	1/7½	1/2¾
Longton	1/7½	1/2¾
Loughborough	1/7½	1/2¾
Louth	1/6	1/1½
Lowestoft	1/5½	1/1½
Luton	1/7	1/2½
Macclesfield	1/7	1/2½
Maidenhead	1/6	1/1½
Maidstone	1/6	1/1½
Malvern	1/6	1/1½
Manchester	1/7½	1/2¾
Manningtree	1/4½	1/0½
Mansfield	1/7½	1/2¾
March	1/4½	1/0½
Margate	1/5½	1/1½
Market Harborough	1/6½	1/2
Matlock	1/6	1/1½
Melton Constable	1/4	1/0
Melton Mowbray	1/6½	1/2
Merthyr	1/7½	1/2¾
Middlesbrough	1/7½	1/2¾
Middleton	1/7½	1/2¾
Middlewich	1/7	1/2½
Milford Haven	1/6	1/1½
Morecambe	1/7½	1/2¾
Morley	1/7½	1/2¾
Mundesley	1/4½	1/0½
Nantwich	1/7	1/2½
Nelson	1/7½	1/2¾
Newark-on-Trent	1/7	1/2½
Newbury	1/5½	1/1½
Newcastle-on-Tyne	1/7½	1/2¾
Newcastle-u-Lyme	1/7½	1/2¾
New Forest	1/4½	1/0½
Newmarket	1/5½	1/1½
Newport, Mon.	1/7½	1/2¾
Newport Pagnell	1/5½	1/1½
Northampton	1/7½	1/2¾
Norwich	1/7½	1/2¾
Nottingham	1/7½	1/2¾
Nuneaton	1/7½	1/2¾
Oakham	1/6	1/1½
Oldham	1/7½	1/2¾
Ormskirk	1/7½	1/2¾
Oxford	1/7	1/2¼
Oxted	1/6	1/1½
Paignton	1/7	1/2½
Peterborough	1/7	1/2¼
Plymouth	1/7½	1/2¾
Pontefract	1/7½	1/2¾
Pontypridd	1/7½	1/2¾
Port Talbot	1/7½	1/2¾
Portsmouth	1/7	1/2¼
Preston	1/7½	1/2¾
Pulborough	1/5½	1/1½
Ramsgate	1/5½	1/1¾
Reading	1/7	1/2¼
Redditch (Northern)	1/6½	1/2
Redhill	1/6	1/1½
Ripon	1/6	1/1½
Rochdale	1/7½	1/2¾
Rochester	1/6½	1/2
Rugby	1/7½	1/2¾
Saffron Walden	1/4½	1/0½
St. Albans	1/7	1/2¼
St. Helens	1/7½	1/2¾
St. Neots	1/4½	1/0½
Salisbury City	1/4½*	1/0½
Salisbury Plain	1/6½*	1/2
Sawbridgeworth	1/6	1/1½
Saxmundham	1/4	1/0
Scarborough	1/7	1/2½
Scunthorpe	1/7½	1/2¾
Selby	1/7½	1/2¾
Sevenoaks	1/6	1/1½
Sheerness	1/5	1/0¾
Sheffield	1/7½	1/2¾
Shipley	1/7½	1/2¾
Shoeburyness	1/7	1/2½
Shoreham	1/6½	1/2
Shrewsbury	1/6½	1/2
Sittingbourne	1/5½	1/1½
Skegness	1/6½	1/2
Sleaford	1/6	1/1½
Slough	1/6½	1/2
Southampton	1/7	1/2½
Southend-on-Sea	1/7	1/2½
Southport	1/7½	1/2¾
South Shields	1/7½	1/2¾
Spalding	1/5½	1/1½
Stafford	1/7	1/2½
Staines	1/6½	1/2
Stamford	1/6½	1/2
Stevenage	1/6	1/1½
Stockport	1/7½	1/2¾
Stockton-on-Tees	1/7½	1/2¾
Stoke-on-Trent	1/7½	1/2¾
Stourbridge	1/7	1/2½
Stourport	1/7	1/2½
Stowmarket	1/4½	1/0½
Stratford-on-Avon	1/6½	1/2
Stroud	1/6†	1/1½
Sunderland	1/7½	1/2¾
Sutton Coldfield	1/7½	1/2¾
Swaffham	1/4	1/0
Swanage	1/5½*	1/1½
Swansea	1/7½	1/2¾
Swindon	1/6*	1/1½
Tamworth	1/7	1/2½
Taunton	1/5½	1/1½
Tenterden	1/5½	1/1½
Thames Haven	1/7½	1/2¾
Thetford	1/5	1/0¾
Thorpe Bay	1/7	1/2½
Todmorden	1/7½	1/2¾
Tonbridge	1/6	1/1½
Torquay	1/7	1/2½
Totnes	1/5½	1/1½
Trowbridge	1/4½*	1/0½
Truro	1/4½	1/0½
Tunbridge Wells	1/6	1/1½
Uppingham	1/6	1/1½
Uttoxeter	1/6	1/1½
Wakefield	1/7½	1/2¾
Walsall	1/7½	1/2¾
Walsden	1/7½	1/2¾
Walton-on-Naze	1/5½	1/1¾
Ware	1/7	1/2½
Warminster	1/4½*	1/0½
Warrington	1/7½	1/2¾
Warwick	1/7½	1/2¾
Wellingborough	1/7	1/2½
Welwyn	1/6½	1/2
Welwyn Gar. City	1/7½	1/2¾
Wells (Norfolk)	1/4	1/0
West Bromwich	1/7½	1/2¾
Westcliff-on-Sea	1/7	1/2½
Weston-super-Mare	1/6½	1/2
Weybridge	1/6½	1/2
Weymouth	1/5*	1/0¾
Whitby	1/6½	1/2
Whitstable	1/5½	1/1¾
Widnes	1/7½	1/2¾
Wigan	1/7½	1/2¾
Wigton	1/6	1/1½
Willington	1/7	1/2½
Wilmslow	1/7½	1/2¾
Winchester	1/6	1/1½
Windermere	1/6	1/1½
Windsor	1/6½	1/2
Wisbech	1/5	1/0¾
Witham	1/5½	1/1½
Woking	1/6	1/1½
Wokingham	1/5½	1/1¾
Wolverhampton	1/7½	1/2¾
Woodbridge	1/5	1/0¾
Worcester	1/7	1/2½
Workington	1/6	1/1½
Worksop	1/7	1/2½
Worthing	1/5½	1/1¾
Wrexham	1/7	1/2½
Wroxham	1/5	1/0¾
Wycombe	1/6	1/1½
Wymondham	1/4½	1/0½
Yeovil	1/6	1/1½
York	1/7½	1/2¾

* Painters 1d. less than other Craftsmen. † Painters ½d. less than other Craftsmen. ‡ Plasterers 1/10½.

¶ Tradesman's Labourers 1/4½. Navvies and General Labourers 1/4.

§ Joiners, Plumbers, Bricklayers, Tilers and Masons receive 2/- per week or 4d. per day Tool Money.

For Building Trade Wages in Scotland, see page 1248.

CURRENT PRICES FOR BUILDING WORK IN LONDON.

Note.—These prices apply to new buildings only. They cover superintendence by foreman and carry a profit of 10 per cent. on the prime cost without establishment charges. A percentage of 1½ should be added for Employers' Liability and National Health and Unemployment Acts, and from 1s. 6d. per £100 Fire Insurance. The whole of the information given is copyright.

PRELIMINARIES.		£	s.	d.
Hoardings, with suitable gate, 8 ft. high	per ft. run	0	3	0
Steel scaffolding for brickwork	per sqre.	1	5	0
Steel scaffolding for stone building	,,	1	10	0
Steel gantry for stone building	per ft. run	2	10	0
Office, shed for cement and mess-room	say	75	0	0
EXCAVATOR.				
Digging, throwing out and filling into carts and carting to shoot, 5 ft. deep	per yd. cube	0	7	9
Add if stiff clay	,,	0	1	0
Add for every additional 5 ft.	,,	0	0	6
Add if in trenches	,,	0	0	9
Add to price of digging for breaking up concrete foundation and brickwork	,,	0	10	0
Return, fill and ram	,,	0	1	9
Fill into carts and cart away	,,	0	3	6
Planking and strutting to trenches	per ft. super	0	0	3½
Planking and strutting to sides of basement excavation next roadway	,,	0	1	4
Needling, flying and raking shores and removing after and carting away	per ft. cube	0	6	9
CONCRETOR.				
Portland cement and ballast concrete 1-6 in. foundations	per yd. cube	1	2	0
Add in underpinning in short lengths	,, ,,	0	6	0
Concrete in floors, ¾ in. aggregate, and sand, 1-2-4—				
4 in. thick	per yd. super	0	3	4
6 in. thick	,, ,,	0	4	8
Add if trowelled smooth	,, ,,	0	0	9
Add for hoisting, each floor	,, ,,	0	0	3
Concrete 1-2-4 in. beams and stanchions	per ft. cube	0	1	4
Concrete in lintols, with steel rod reinforcement each 4½ in. width and shuttering	,, ,,	0	4	0
1½ in. centering, with stout supports for concrete floors	per square	2	2	0
Do. to sides and soffites of beams	per ft. super	0	0	8
Do. to sides of stanchions	,, ,,	0	0	7
Steel rod reinforcement under ⅝ in. diameter, cut, bent and placed in position	per cwt.	1	8	0
Do. do. over ⅝ in. diameter	,,	1	5	0
BRICKWORK.				
Reduced to 1½ brick in flettons, lime mortar	per rod	26	0	0
Add for 2nd hard stocks	,,	8	0	0
Add for Blue Staffordshire	,,	22	0	0
Add to above if in 1-4 cement	,,	0	15	0
Add if in backing to stonework	,,	1	5	0
Add if in underpinning in cement	,,	4	10	0
Add if above 40 ft. to 60 ft. high	,,	2	0	0
SUNDRIES.				
Damp course in double course of slates, breaking joint	per ft. super	0	0	11
Vertical do. do.	,,	0	1	2
Bitumastic	,,	0	0	5
Lead core	,,	0	0	10
Cut, tooth and bond new to old brickwork	,,	0	1	0
Rake out joints of brickwork	,,	0	0	1
Leave chase for concrete floor	per ft. run	0	0	2
Cut chase 4½ in. deep for concrete floor	,,	0	1	2
Leave chase for vertical pipe	,,	0	0	4
Cut chase for vertical pipe	,,	0	1	4
Rake out joint for flashings and point	,,	0	0	2
Do. stepped do.	,,	0	0	4
Do. for asphalt skirting	,,	0	0	2
Build in ends of timbers	each	0	0	4
Do. steel joists up to 12 in. deep	,,	0	0	6
Do. step and make good facings	,,	0	1	6
Set and flaunch chimney pots	,,	0	7	6
Render fire openings	,,	0	2	0
Bed and point door frames one side	,,	0	3	0
Do. both sides	,,	0	4	6
Do. window frames, one side	,,	0	4	0
Setting only register grate	,,	1	0	0
Do. interior hearths and mantles	,,	1	15	0
Do. kitchen range, large	,,	5	0	0
Fix air brick and form flue	,,	0	2	0
Cut holes for pipes and make good facings, 9 in. wall	,,	0	2	0
Do. do. 13½ in. wall	,,	0	2	6
Do. large pipes and do. 9 in. wall	,,	0	3	0
Do. do. 13½ in. wall	,,	0	3	6
FACINGS.				
Extra for facings in Flemish bond for each 10s. per thousand over the price of Flettons	per ft. super	0		1¼
Pointing facings to approval	,,	0		3
Arches extra over Flettons in stocks	,,	0		8
Do. in reds	,,	1		0
Do rubbed and gauged in putty	,,	5		9

PARTITIONS.		£	s.	d.
2 in. breeze slab partitions in cement	per yd. super		4	0
3 in. do. do.	,,		4	6
2 in. hollow-tile do.	,,		4	9
3 in. do. do.	,,		5	6
PAVING.				
1 in. granolithic paving gauged 5—2	per yd. super		2	7
1½ in. do. do.	,,		2	11
1 in. × 6 in. covered skirting	per ft. run		0	10
ASPHALT (NATURAL).				
½ in. horizontal damp course	per ft. super		0	6
⅝ in. horizontal damp course	,,		0	8
¾ in. vertical do. in two layers	per yd. super		9	6
¾ in. in flats, two layers	,,		6	0
Angle fillet	per ft. run		0	3
6 in. skirting and angle fillet and jointing top edge	,,		1	0
DRAINAGE.				
Excavate, trench for drain and throw out, return, fill and ram, and including any planking and strutting required, and cart away surplus earth per ft. run	1 ft. deep	0	5	
	2 ft. deep	0	10	
	3 ft. deep	1	3	
	4 ft. deep	1	8	
	5 ft. deep	4	2	
	6 ft. deep	5	0	
	7 ft. deep	5	10	
	8 ft. deep	6	8	
4 in. best quality glazed stoneware drain pipe, socketed joints, yarn and neat cement, on and including cement concrete bed, 18 in. wide and 6 in. thick, and benched up on each side of pipe	per ft. run		2	4
6 in. do. do. do. but concrete bed 20 in. and 6 in. thick	,,		3	0
9 in. do. do. do. but concrete bed 23 in. wide and 6 in. thick	,,		4	11
Extra for 4 in. bends	each		2	6
Do. 6 in. ,,	,,		3	6
Do. 9 in. ,,	,,		5	6
Extra for 4 in, junctions	,,		2	9
Do. 6 in. ,,	,,		3	9
Do. 9 in. ,,	,,		6	0
4 in. stoneware gully, encased in concrete and making good granolithic paving	,,		13	0
6 in. do.	,,		14	0
9 in. do.	,,		18	6
4 in. stoneware interceptor, and surround with concrete	,,	1	5	0
6 in. do.	,,	1	10	0
9 in. do.	,,	2	10	0
IRON DRAINS.				
4 in. C.I. drain and laying and jointing in molten lead	per ft. run		3	4
6 in. do. do.	,,		5	0
Extra for 4 in. bends	each		10	0
Extra for 6 in. bends	,,		18	0
Extra for 4 in. junctions	,,		17	6
Extra for 6 in. junctions	,,		30	0
MASON.				
Bath stone and all labour, fixed	per ft. cube		10	9
Portland stone and all labour, fixed	,, ,,		17	9
York stone templates, fixed	,, ,,		12	6
York stone steps, fixed	,, ,,		16	0
York stone cills, fixed	,, ,,	1	2	0
SLATER.				
24 × 12 Bangor slates laid to 3 in. lap secured with zinc nails	per square	3	18	6
20 × 10 do.	,,	3	13	6
16 × 8 do.	,,	3	11	6
Extra to eaves course	per ft. run		0	9
Extra to top edge and square abutments	,,		0	4½
Extra to verge and labour only, bedding and pointing	,,		0	7½
Raking, cutting and waste	,,		0	7
Half-round red ridge tile	,,		1	2
Half-round blue ridge tile	,,		1	8
Fixing only soakers	per dozen		0	9
Red hand-made sand-faced tiles laid to 4 in. gauge, nailed every fifth course with galvanised iron nails	per square	3	0	0
Extra to eaves course	per ft. run		0	5
Extra to top edge and square abutments	,, ,,		0	3½
Extra to verge and bed and point	,, ,,		0	11
Half-round ridge	,, ,,		1	4
Bonnet hips, including cutting and waste (both sides)	,, ,,		3	8
Valley tiles, including cutting and waste (both sides)	,, ,,		3	6
Fixing only soakers	per dozen		0	9

CURRENT PRICES FOR BUILDING WORK IN LONDON.—continued.

CARPENTER AND JOINER.

		s.	d.
Fir framed in plates	per ft. cube	4	0
Do. joints	,, ,,	4	6
Do. roofs, etc	,, ,,	5	3
Do. trusses	,, ,,	6	9

		¾in.	1in.	1¼in.
Deal rough close boarding	per sq.	32/–	38/–	47/–
Battens for slating	,,	10/–	11/–	12/–

		s.	d.
Centre for arches	per ft. super	1	6
Gutter boards and bearer	,, ,,	1	0

FLOORING.

		¾in.	1in.	1½in.	1¾in.
Deal edges shot	per sq.	—	41/–	49/–	58/–
Do. tongued and grooved	,,	—	46/–	55/–	67/–
Do. matchings	,,	42/–	47/6	—	—
Moulded skirtings, including backings and grounds	per ft. super	1/4	1/7	1/9	2/3
Mitres	each	–/6	–/8	–/9	1/–
Stop ends	,,	–/3	–/4	–/4	–/6

SASHES AND FRAMES.

		s.	d.
One-and-a-half in. moulded sashes	per ft. super	1	9
Two in. do. do.	,, ,,	2	0
Add for fitting and fixing	,, ,,	0	2
Deal cased frames, 1 in. linings, 1¼ in. pulley, and stiles, 2 in. moulded sashes, in squares, hardwood cill, double hung with pulleys, lines and weights, average size	,, ,,	3	3

DOORS.

		1½in.	1¾in.	2in.
Two-panel square framed	per ft. super	2 1	2 3	2 5
Four-panel do.	,, ,,	2 4	2 6	2 9
Two-panel moulded both sides	,, ,,	2 6	2 9	2 11
Four-panel do. do.	,, ,,	2 9	2 11	3 2

		£	s.	d.
Flush doors. 1½ in. to 2 in. finished thickness skeleton core, covered each side with Columbian pine ply, solid pine edging, 2 ft. 6 in. by 6 ft. 6 in.	each	1	15	0
Do., covered with Gaboon mahogany ply, solid mahogany edging, 2 ft. 6 in. by 6 ft. 6 in.	,,	2	0	0
Solid core, all as first item	,,	2	0	0
Solid core, all as second item	,,	2	5	0
Shaped peep holes, 4 sided	,,	0	5	0
Hexagonal holes	,,	0	6	0
Circular holes	,,	0	7	0

FRAMES.

		s.	d.
Deal wrot moulded and rebated	per ft. cube	12	0
Hardwood do. do.	,, ,,	36	0

		1in.	1¼in.	1½in.
Plain deal jamb linings, framed	per ft. super	1 7	1 8	1 11
Deal shelves and bearers	,, ,,	1 2	1 4	1 7
Add if cross-tongued	,, ,,	–/2	–/2	–/2
Deal window board, tongued to oak, cill and bearers	,, ,,	1 6	1 9	2 0

		s.	d.
Deal moulding, tongued and grooved to window board	per ft. run	0	6

SUNDRIES.

		s.	d.
Deal architrave, including mitres per sectional inch	per ft. run	0	1
Glazing beads, deal fixed	,, ,,	0	2
Do. fixed with brass screws and cups	,, ,,	0	4
Rebate	,, ,,	0	0½
Groove	,, ,,	0	0½
Notching	,, ,,	0	2
Tongued and grooved angle	,, ,,	0	3½
Rounded heel and hollow	,, ,,	0	2½

STAIRCASES.

		1in.	1¼in.	1½in.	2in.
Deal treads and risers on and including rough brackets	per ft. super	2/–	2/3	2/8	—
Deal strings, wrot and framed	,, ,,	—	—	2/2	2/8

		£	s.	d.
Housings	each		0	9
Mahogany handrail, average 3 in. x 3 in.	per ft. run		5	6
Add if ramped	,, ,,		11	0
Add if wreathed	,, ,,	1	2	0

FIXING ONLY IRONMONGERY.

	s.	d.
Barrel bolts	0	8
Sash fasteners	1	0
Casement fasteners	1	2
Casement stays	1	2
Flush bolts	1	6
Cupboard locks	1	6
Rim locks and furniture	2	0
Mortice locks and furniture	4	0
Floor springs, including oil	20	0
Overhead springs	5	0

FOUNDER AND SMITH.

			s.	d.
Rolled steel joists, delivered and fixed		Per cwt.	19	0
Compound girders,	do	,,	22	0
Stanchions,	do	,,	24	0
Roofwork,	do	,,	29	0

RAINWATER GOODS.

		3 in.	4 in.	5 in.	6 in.
Half-round eaves gutters and fixing	per ft. run	1/3	1/4	1/10	1/11
Ogee do. do.	,, ,,	1/5	1/6	2/1	2/9
R.W. pipe and fixing	,, ,,	1/7	2/1	—	—
Extra for shoes and bends	each	3/3	4/6	—	—
Do. stopped ends	,,	1/3	1/7	2/–	3/–
Do. nozzles and angles	,,	2/7	3/–	4/2	4/8

PLUMBER.

		s.	d.
Milled lead and laying in flashings and gutters	per cwt.	38	0
Do. in flats	,,	36	6
Extra labour and solder in cesspools	each	6	0
Welt joint	per ft. run	0	4
Soldered seam	,, ,,	1	6
Copper nailing—close	,, ,,	0	3
Do. do. open	,, ,,	0	2
Soldered dots	each	2	0
Bossed ends to rolls	,,	0	6

	½in.	¾in.	1 in.	1¼ in.	1½ in.	2 in.	4 in.
Lead overflow per ft. run	–/8½	1/–	1/6	1/9	2/1	2/9	—
,, service ,,	1/2	1/9	2/8	3/6	4/–	5/3	—
,, soil ,,	—	—	—	—	—	—	6/–
Bends in pipe each	—	—	—	—	1/9	2/–	5/6
Wiped solder joints ,,	1/9	2/3	2/6	3/–	3/4	4/–	5/9
Lead traps and cleaning screws ,,	—	—	—	6/6	9/6	—	—
Stopcocks and joints ,,	11/–	14/–	18/–	—	—	—	—

PLASTERER.

		s.	d.
Render, float and set in lime and hair	per yd. super	1	10½
Do. narrow widths	per ft. super	0	4
Do. and set with Sirapite	per yd. super	1	11
Do. narrow widths	per ft. super	0	4
Do. and set with Keenes	per yd. super	2	9
Do. narrow widths	per ft. super	0	5
Add sawn lathing	per yd. super	1	0
Add metal lathing (not including hangers or runners for suspended ceilings)	,, ,,	2	0
Portland cement screed	,, ,,	1	6
Do. plain face	,, ,,	3	0
Mouldings in plaster	per 1 in. girth	0	1½

GLAZIER.

		s.	d.
24 oz. sheet	per ft. super	0	7¼
26 oz. sheet	,, ,,	0	8
24 oz. Obscured sheet	,, ,,	0	8¾
Double Cathedral	,, ,,	0	9½
Majestic	,, ,,	0	10
Flemish	,, ,,	0	10
Pinhead Morocco	,, ,,	0	10
⅛ in. rough rolled or cast plate	,, ,,	0	10¾
¼ in. wired cast plate	,, ,,	1	1¾

PAINTER.

		s.	d.
Preparing and distempering, two coats	per yd. super	0	7½
Knotting and priming	,, ,,	0	7
Plain painting, one coat	,, ,,	0	9
Do. two coats	,, ,,	1	2
Do. three coats	,, ,,	1	9
Do. four coats	,, ,,	2	4
Graining	,, ,,	2	3
Varnishing, twice	,, ,,	1	9
Sizing	,, ,,	0	3
Flatting	,, ,,	0	7
Enamel	,, ,,	1	1
Wax polishing	per ft. super	0	6
French polishing	,, ,,	1	2
Preparing for and hanging paper	per piece	2/– to 4/–	

PRICES CURRENT OF MATERIALS*

Owing to the exceptional circumstances which prevail at the present time prices of materials should be confirmed by inquiry.

BRICKS, &c.

Delivered to site, City and Central Area. Full Lorry Loads. £ s. d.

Best Stocks 4 15 0
Second Hard Stocks 4 8 0

Per 1,000. Delivered at London Goods Stations.

2½ in. Phorpres.	King's Cross Station. per 1,000. s. d.	To sites in W.C. District. per 1,000 s. d.
Pressed bricks	46 3	50 6
Cellular bricks	46 3	50 6
Keyed bricks	48 3	52 6
Cellular Keyed bricks	48 3	52 6
Rustic bricks	*66 3	*70 6
Cellular Rustic bricks	*66 3	*70 6
Single Bullnose	64 3	68 6
White bricks	*66 3	*70 6
Sandfaced bricks	—	75 6

* Subject to a special discount of 2s. per 1,000 ft. accompanied by order for Pressed.

	£ s. d.
White Midhurst Facing Bricks (delivered London site)	3 12 6
Best blue Pressed Staffs	8 6 6
Do. Bullnose	8 16 6
Blue Wire Cuts	7 4 0

Best Stourbridge Fire Brick :—

£ s. d.	£ s. d.
2½ in. 7 15 0	3 in. 8 15 0

GLAZED BRICKS—

Best White Ivory and Salt Glazed Stretcher.	24 0 0	D'ble Str'tch'rs	32 10 0
		D'ble Headers	29 10 0
		One side & two ends	33 10 0
Headers	23 10 0	Twosides&one end	34 10 0
Quoins, Bullnose and 4½in. Flats	30 10 0	Splays and Squints	31 0 0

Second Quality, £1 per 1,000 less than best. Cream and buff, £2 extra over white. Other colours. Hard Glaze, £5 10s. extra over white.

PARTITION SLABS.

Delivered London Area.

PHORPES " HOLLOW PARTITION BLOCKS.

2" per yd. sup.	2 3	3" per yd. sup.	2 9
2½" "	2 6	4" "	3 1

CLINKER CONCRETE.

2" per yd. sup.	1 6	3" per yd. sup.	2 0
2½" "	1 8	4" "	2 4

CRANHAM TERRA COTTA.

2" per yd. sup.	3 0	3" per yd. sup.	3 8
2½" "	3 6	4" "	4 7

HEMPSTEAD—KEYED TWO SIDES.

12" x 9" x 2"	2 6	12" x 9" x 3"	3 0
12" x 9" x 2½"	2 9	12" x 9" x 4"	3 9

Per yard super d/d. Free on site, London.

	s. d.	
Thames Ballast	7 3	per yd.
Pit Ballast	6 3	" "
Pit Sand	7 9	" "
Washed Sand	8 3	" "
¼in. Shingle	7 3	" "
¼in. Broken Brick	11 3	" "
Pan Breeze	8 3	" "

delivered 2 miles radius Paddington.

CEMENT.

Best British Portland Cement. Standard Specification delivered London Area in jute sacks (11 to ton), or paper bags (20 to ton) free (non-returnable) :— £ s. d.

4 ton loads and upwards site ..... Per ton 2 1 0
1 ton to 4 tons site 2 4 0
Alongside Vauxhall in 80-ton lots 1 18 6
"Ferrocrete" Rapid Hardening Cement :—
4 ton loads and upwards site 2 7 0
1 ton to 4 tons site 2 10 0
Alongside Vauxhall in 80-ton lots 2 4 6

Stores in Reserved Bins at Works 1/6 ton extra.

NOTE.—Jute sacks are charged 1s. 6d. each and credited 1s. 6d. nett, if returned in good condition within three months, carriage paid.

"Aquacrete" Water Repellent, "Blue Circle" Cement, 30/- per ton extra on ordinary "Blue Circle" Portland Cement prices.

"Colorcrete" Nos. 1 and 2 Coloured Rapid Hardening Portland Cement in 1-cwt. paper bags free (non-returnable) in 1-ton lots and upwards site 3 9 0

"Colorcrete," not rapid-hardening, in 1-cwt. paper bags free (non-returnable), according to colour, from £7 to £15 10s. per ton.

"Snowcrete" White Portland Cement in 1-cwt. paper bags free (non-returnable)

1 tons and upwards site	8 15 0		
Super Cement (Waterproof) paper bags free	3 11 0		
Roman Cement £6 15	Keene's Cement, White	5 10 0	
Parian Cement £5 10	" Pink	5 2 6	

Cementone Colours for cement according to tints per cwt. from £2 16s. 0d.

PLASTER.

	£ s. d.		£ s. d.
Coarse, Pink	3 0 0	Sirapite. Coarse	3 10 0
" White	3 1 0	" Finish	3 18 0
Pioneer	3 10 6		
Super Carbo	2 7 6	4-ton loads and over London	
Carbo Setting	2 12 6	Area, paper bags free.	
Best Ground Blue Lias Lime	1 17 6	Grey Stone Lime	2 2 0
		Chalk Lime	2 2 0
Granite Chippings	1 0 0	Hair per cwt.	2 7 6

NOTE.—Sacks are charged 1s. 9d. each, and credited 1s. 6d., if returned in good condition within three months, carriage paid.

Stourbridge Fireclay in sacks 37s. per ton at rly. dep.

STONE.

BATH STONE.—Delivered in railway trucks at Westbourne Park, Paddington, G.W.R., or South Lambeth, G.W.R., per ft. cube .... s. d. 2 10½

BEER STONE—RANDOM BLOCK—
Free on rail at Seaton Station. per ft. cube 2 3
Delivered free on rail Nine Elms, S.R. " 3 1½
Selected approximate size one way, 1d. per cubic ft. extra, selected approximately three sizes or for special work, 3d. per cubic ft. extra.

PORTLAND STONE—

	s. d.
Brown Whitbed, in random blocks of 20 ft. average, delivered in railway trucks at Nine Elms, S. Rly., South Lambeth Station, G.W.R., and Westbourne Park, Paddington, G.W.R., per ft. cube	4 5
Do. do. delivered on road waggons as above stations, per ft. cube	4 6

White basebed, 3d. per ft. cube extra.

NOTE.—1d. per ft. cube extra for every ft. over 20 ft. *average* and ¼d. beyond 30 ft.

HOPTON-WOOD STONE—

F.O.R. Quarries, Wirksworth, Derbyshire, Random blocks from 10 ft. and over P.ft.cb.	14 0
Sawn two sides	22 6

HOPTON-WOOD STONE—

Sawn three or four sides	27 9

YORK STONE, BLUE—*Robin Hood Quality.*
Delivered at any Goods Station, London

6 in. sawn two sides landings to sizes (under 30 ft. super) per ft. super	5 0
6 in. rubbed two sides, ditto "	5 6
3 in. sawn two sides slabs (random sizes) "	2 3½
2 in. to 2½ in. sawn one side slabs (random sizes) (paving) "	1 6½
1½ in. to 2 in., ditto "	1 3½

HARD YORK—
Delivered at any Goods Station, London.

Scrappled random blocks per ft. cube	6 3
6 in. sawn two sides landings to sizes (under 40 ft. super) per ft. super	5 1½
6 in. rubbed two sides, ditto "	6 1½
4 in. sawn two sides slabs (random sizes) "	3 1½
3 in. ditto ditto "	2 5
2 in. self-faced random flags Per yd. super	7 6

CAST STONE.

Delivered in London are in full van loads, per ft. cube: Plain, 7s. 6d. Moulded, 8s. 6d. Sills, 10s. 0d.

HARD WOOD.

1 INCH AND UP THICK.

	£ s. d.
Average price for prime quality.	
Dry Austrian Wainscot, per ft. cube	0 17 0
Dry American and/or Japanese Figured Oak, per ft. cube ..... 10 0 to	0 12 6
Dry American and/or Japanese plain Oak, per ft. cube	0 11 6
Dry sq. edged Honduras Mahogany, per ft. cube	0 15 0
Dry log-cut Honduras Mahogany, per ft. cube ..... 12 6 to	0 16 0
Dry Cuba Mahogany, per ft. cube	0 18 0
Dry Teak, per ft. cube	0 14 0
Dry American Whitewood, per ft. cube	0 10 6
Dry Australian Walnut, per ft. cube	0 17 0
Dry Queensland Silky Oak, per ft. cube	0 11 0
Dry African Mahogany, per ft. cube	0 10 0
Dry African Whitewood, per ft. cube	0 8 0
Dry English Wainscot Oak, per ft. cube	0 16 0
Best Scotch Glue, per cwt.	3 0 0
Liquid Glue, per cwt. ..... 4 7 0 to	5 10 0

SOFT WOOD.

GOOD BUILDING DEAL.

Inches.	Per stan.	Inches.	Per stan.
4 ×11	£28 10	3 × 6	£22 10
4 × 9	28 10	3 ×11	28 10
4 × 8	26 10	2 ×11	28 10
4 × 7	26 10	3 × 9	25 10
3 × 8	22 10	2½× 9	25 10
3 × 7	22 10	3 × 4½	22 10
2½× 7	22 10	3 × 4	22 10

PLANED BOARDS.

1×11	£29 10	1×9	£28 0

PLAIN EDGE FLOORING.

Inches.	Per sq.	Inches.	Per sq.
¾	18/-	1¼	28/-
¾	20/6	1½	35/-
1	22/6		

TONGUED AND GROOVED FLOORING.

Inches.	Per sq.
1	2/6
1¼	29/-
1½	36/-

MATCHING (BEST

Inches.	Per sq.
¾	18/-
¾	21/-
1	23/-

Ins. BATTENS.	s. d.
¾×2 per 100 ft.	2 9

SAWN LATHS.	s. d.
Per bundle	2 6

SLATES.

First quality slates from Penrhyn or Portmadoc, carriage paid in full truck loads to London Rate Station. Per 1,000 actual.

	£ s. d.		£ s. d.
24 by 12	31 5 0	18 by 10	16 10 0
22 by 12	26 5 0	18 by 9	14 17 6
22 by 11	23 12 6	16 by 10	14 7 6
20 by 12	23 2 0	16 by 8	11 6 0
20 by 10	20 15 0		

TILES.

Delivered at London rate stations in full truck loads of not less than 6 tons. ..... Per 1,000 f.o.r. London.

	£ s. d.
Best machine-made tiles from Broseley or Staffordshire district	4 2 6
ditto hand-made ditto	4 17 6
Ornamental ditto	5 2 6
Hip and valley tiles (per dozen) Hand-made	0 8 6
Machine-made	0 8 0

METALS.

JOISTS, GIRDERS, &c., TO LONDON STATION PER TON—

R.S. Joists, cut and fitted	£16 0 0
Plain Compound Girders	19 0 0
" " Stanchions	21 0 0
In Roof Work	25 0 0

NOTE.—These prices are for standard pieces and not special pieces of an awkward nature.

MILD STEEL ROUNDS.—To London Stations, per ton.

Diameter.	£ s. d.	Diameter.	£ s. d.
¼ in.	16 12 6	⅝ in. to ½ in.	15 2 6
⅜ in.	15 12 6	⅝ in. to 2½ in.	14 12 6

WROUGHT-IRON TUBES AND FITTINGS—
(Discount off List for lot of not less than £10 net value delivered direct from Works, 2½ per cent. less above gross discounts, carriage forward, if sent from London Stocks.)

	Standard Wrot. Mild Steel Tubes. and Tubulars. Sizes. ⅛in. to ⅜in.	Standard Flanges. Sizes. ½in. to 2in.	Standard Fittings. ½in. to 2in.
	%	%	%
Gas	60	65	62½ 58½
Water	57	62½	62½ 55
Steam	53½	58½	51½ 50
Gal. gas	50	55	51½ 48½
Galv. water	45	50	43½ 43½
Galv. steam	38½	43½	38½ 40

C.I. HALF-ROUND GUTTERS—London Price ex Works.

Per yd. in 6 ft. lengths.	Gutters.	Angles and Nozzles.	Stop Ends.
3 in.	1/9½	1/8	7d.
3½ in.	2/1	2/-	8½d.
4 in.	2/1	2/-	8½d.
4½ in.	2/2½	2/1	9d.
5 in.	2/4½	2/4	10d.

O.G. GUTTERS.

3 in.	2/1	2/-	8½d.
3½ in.	2/3½	2/2	9½d.
4 in.	2/5	2/4	10½d.
4½ in.	2/6	2/5	1/0½
5 in.	2/10	2/9	1/2½

RAIN WATER PIPES, &c.

Per yd. in 6 fts.	Pipe.	Bends, stock angles.	Branches. stock angles.
2 in.	2/8½	1/8	2/5½
2½ in.	2/9½	1/11	2/11½
3 in.	3/8	2/4½	3/7½
3½ in.	4/1	2/10½	4/1½
4 in.	4/9½	3/5	5/-

Less 20 per cent. trade discount.
Tonnage allowance—4-ton lots, 5 per cent.
2-ton lots, 2½ per cent.

L.C.C. COATED SOIL PIPES—London Prices ex Stock.

	Pipe.	Bends, stock angles.	Branches. stock angles
	s. d.	s. d.	s. d.
2 in. per yd. in 6 fts.	3 5	2 5	2 11
2½ in. "	3 10	2 8	3 8
3 in.	4 2	2 11	4 4
3½ in.	4 7	3 8	5 0
4 in. "	5 1	4 0	5 10

L.C.C. COATED DRAIN PIPES.—London Prices, ex Stock.

	Pipe.	Bends, stock angle.	Branches. stock angles.
	s. d.	s. d.	s. d.
3 in. per yd. in 9 ft. lengths	4 9	5 4	8 9
4 in. " cwt.qr.lbs. 1 1 20	6 9	6 3	11 0
5 in. " 1 2 22	8 4	11 0	16 11
6 in. " 2 0 6	10 0	12 11	21 3

Gaskin for jointing 45/- per cwt.

IRON—	Per ton. £ s. d.	London. £ s. d.
Common Bars	12 15 0	13 15 0
Staffordshire Crown Bars—		
Good merchant quality	14 10 0 to	16 0 0
Staffordshire Marked Bars	18 0 0	19 0 0
Mild Steel Bars	12 18 0	13 18 0
Steel Bars, Ferro-Concrete quality, basic price	14 8 0	15 8 0
Hoop iron, basic prices	14 8 0	15 8 0
" Galvanised	24 8 0	26 8 0

* The information given on this page has been specially compiled for THE BUILDER, and is copyright. The aim in this list is to give, as far as possible, the *average* prices of materials, not necessarily the highest or lowest. Quality and quantity obviously affect prices—a fact which should be remembered by those who make use of this information. Prices are subject to 2½ per cent. cash discount.

HUDDERSFIELD
Building Society

Experience has shown that the arrangements made by the Huddersfield to assist occupier borrowers have given the utmost satisfaction, and the service rendered has been greatly appreciated.

Write for information to The Huddersfield Building Society, Britannia House, 203, Strand, London, W.C.2, or to the Head Office, Britannia Buildings, Huddersfield. Andrew Stewart, C.A., Managing Director.

WHEN YOU INVEST—A HOUSE IS BEST

PRICES CURRENT OF MATERIALS—*(contd)*

IRON—	Per ton in London. £ s. d.	£ s. d.
Soft Steel Sheets, Black—		
Ordinary sizes, to 20 g. ..	16 5 0 ..	17 5 0
" " 24 g. ..	17 5 0 ..	18 5 0
" " 26 g. ..	18 5 0 ..	19 5 0
Sheets, Flat, Best Soft Steel, C. R. and C.A. quality—		
Ordinary sizes, 6 ft. by 2 ft. to 3 ft. to 22 g. and 24 g.	17 10 0 ..	18 10 0
Ordinary sizes, 6 ft. by 2 ft. to 3 ft. to 26 g....	19 10 0 ..	20 10 0
No. 1 quality £4 per ton extra.		
Flat and Galvanised Corrugated Sheets—		
Ordinary sizes. 6 ft. to 9 ft. to 20 g.	18 5 0 ..	20 5 0
Ordinary sizes, 6 ft. to 9 ft. to 22 g. and 24 g..	18 15 0 ..	22 5 0
Ordinary sizes, 6 ft. to 9 ft. to 26 g.	20 15 0 ..	22 15 0
Sheets, Galvanised, Flat, Best quality—		
Best Soft Steel Sheets, 6 ft. by 2 ft. to 3 ft. to 20 g. and thicker	19 5 0 ..	22 5 0
Best Soft Steel Sheets, 22 g. and 24 g.	20 5 0 ..	21 15 0
Best Soft Steel Sheets, 26 g.	21 15 0 ..	22 15 0
Cut Nails, 3 in. to 6 in.	19 0 0 ..	21 0 0
(Under 3 in. usual trade extras.)		

METAL WINDOWS.—Standard sizes, suitable for complete houses, including all fittings, painting two coats and delivery to job, average price about 1s. 4d. to 1s. 7d. per foot super.

COPPER

		s. d.
Seamless Copper tubes (basis).	per lb.	1 1
Strong sheet	"	1 3
Thin	"	1 4
Copper nails	"	1 3
Copper wire	"	1 3

PLUMBERS' BRASS WORK.

Delivered in London.
Stamped by Met. Water Board.

CRUTCH HEAD SCREW DOWN BIB COCKS FOR IRON. EASY CLEAN.

½ in.	¾ in.
29/-	45/- per doz.

CHROMIUM PLATED TOILET SCREW DOWN BIB COCKS FOR IRON. EASY CLEAN.

½ in.	¾ in.
40/-	59/- per doz.

SCREW DOWN STOP COCKS FOR IRON.

⅜ in.	½ in.	¾ in.	1 in.	1¼ in.	1½ in.	2 in.
31/-	44/6	75/-	175/-	250/-	396/- per doz.	

SCREW DOWN STOP COCKS WITH TWO UNIONS FOR LEAD.

⅜ in.	½ in.	¾ in.	1 in.	1¼ in.	1½ in.	2 in.
42/6	65/-	102/-	195/-	210/-	510/-per doz.	

DOUBLE NUT BOILER VCREWS.

½ in.	¾ in.	1 in.	1¼ in.	1½ in.	2 in.
7/6	9/-	14/-	24/-	37/6	54/-per doz.

HEAVY CROYDON BALL VALVES.

½ in.	¾ in.	1 in.	1¼ in.	1½ in.
33/6	55/6	85/-	165/-	237/- per doz.

CAPS AND SCREWS.

1¼ in.	1½ in.	2 in.	3 in.	3½ in.	4 in.
9/-	11/-	16/6	29/-	42/-	45/- per doz.

BRASS FERRULES OF SLEEVES.

1½ in.	2 in.	3 in.	3½ in.	4 in.
9/6	11/6	20/6	26/-	37/- per doz.

DRAWN LEAD TRAPS WITH BRASS CLEANING SCREWS.

1½ in.	1½ in.	2 in.	3 in.	
8 lb. Lead P...	17/6	23/-	32/6	66/6 per doz.
8 lb. Lead S...	21/6	27/6	39/6	73/- per doz.

SOLDER.—Plumbers', 1/1, Tinmen's, 1/3, Blowpipe, 1/5 per lb.

PAINTS, &c.

		£ s. d.
Raw Linseed Oil, in pipes	per gallon	0 2 7
" " " in barrels	"	0 2 9
" " " in drums	"	0 2 11
Boiled " " in barrels	"	0 3 0
" " " in drums	"	0 3 2
Turpentine, in barrels	"	0 3 2
" in drums (10 gals.) ..	"	0 3 4
Genuine Ground English White Lead, per ton (In not less than 5-cwt. casks.)		49 0 0
Extra for 1-cwt. kegs over 5-cwt. casks is 2/9 cwt.		
GENUINE WHITE LEAD PAINT. "Father Thames," "Nine Elms," "Park," "Supremus," "St. Pauls," "Morganswyte," "Polacco," "J" Brand, and other best brands (in 14-lb. tins) not less than 5-cwt. lots per ton delivered		68 0 0
Red Lead, Dry (packages extra) ..	per ton	38 0 0
Best Linseed Oil Putty	per cwt.	0 14 9
Size. XD quality	fkn.	0 3 6

VARNISHES, &c.

		Per gallon.
Oak Varnish	Outside	0 14 0
Fine do.	"	0 16 0
Fine Copal	"	0 18 0
Pale Copal	"	1 0 0
Pale Opal Carriage	"	1 4 0
Best do.	"	1 12 0
Floor Varnish	Inside	0 18 0
Fine Pale Paper	"	0 18 0
Fine Copal Cabinet	"	1 2 0
Fine Copal Flatting	"	1 0 0
Hard Drying Oak	"	0 18 0
Fine Hard Drying Oak	"	0 19 6
Fine Copal Varnish	"	1 0 6
Pale do.	"	1 12 0
Best do.	"	1 2 6
Best Japan Gold Size		1 12 6
Best Black Japan		0 10 0
Oak and Mahogany Stain (water)		0 12 0
Brunswick Black		0 7 6
Berlin Black		0 14 0
Knotting (patent)		0 15 0
French and Brush Polish		0 12 0
Liquid Dryers in Terebene		0 9 0
Cuirass Black Enamel		0 7 0

THE SCOTTISH BUILDER

NEW BUILDINGS

The Editor welcomes authentic information for this feature from architects, surveyors or contractors. Where business representatives cannot be seen personally at this stage, this should be mentioned. Items should reach 4, Catherine-street, Aldwych, W.C.2, not later than Wednesday morning.

ABERDEEN.—EXTENSIONS.—The Watching Committee of the T.C. are to erect a building on a site adjacent to police headquarters in Lodge Walk, at £7,050.

BATHGATE. — SCHOOL. — The Dean of Guild Court have approved of plans for a new R.C. school for juveniles and juniors in Easton-road. The cost is £13,600.

BISHOPBRIGGS. — FACTORY. — Work has started on the erection of a new roofing tile factory at Crofthead, for the Marley Tile Co., Ltd., of Riverhead, Sevenoaks, Kent. Mr. J. Thomson King, of Glasgow, is the architect.

CARGIN.—FACTORY.—Plans have been prepared by Messrs. Wylie, Shanks and Wylie, architects, 204, West Regent-street, Blythswood, Glasgow, for new factory buildings.

EDINBURGH.—ADDITIONS.—The Dean of Guild Court has passed plans for the Church of Scotland Trust, on behalf of the Christian Life and Social Work Committee of the Church of Scotland, addition and alterations at Church of Scotland Lodging House, Brunswick-road.

FIFE.—HOUSING.—Erection of 212 houses in West Fife was recommended by the Dunfermline local committee of Fife C.C.

GLASGOW.—HOUSES.—The first step to provide Glasgow with 7,000 extra municipal houses was made by the civic Sub-Committee of Sites and Buildings agreeing to apply for an order for the compulsory acquisition of 690 acres on the Carscadden estate.

GLASGOW.—BUILDING.—The Corporation has approved of the following plans: Extension to the Southern General Hospital maternity block at £10,000; gymnasium at Bellahouston Academy at £16,234; and a footbridge over the river Clyde at Polmadie at £10,000.

GREENOCK.—HOUSES.—The Corporation has agreed to proceed with 78 houses on the Orchard Refinery and corner of Inglestonstreet and Upper Cartsburn-street. Plans are by the Director of Housing.

HADDINGTON.—INSTITUTION.—The Dean of Guild Court has granted warrant to the East Lothian C.C. for additions at the Knox Institution, Victoria-road.

KILMARNOCK.—HOSTEL.—The Dean of Guild Court has granted the T.C. sanction for the erection of a girls' hostel in Wellington-street, at £4,000.

KIRKWALL.—HOUSES.—The T.C. are to build 39 houses on a section of the St. Magnus Cathedral Glebe, at over £21,000.

INVERNESS.—The Housing Committee of the T.C. recommend that Messrs. A. Craig, Ltd., be asked to furnish plans, specifications, and schedules of three-, four- and five-apartment brick houses, together with an estimated price for a single block, and also for 200 houses.

LEITH.—WAREHOUSE.—Plans have been prepared under the supervision of Leith Dock Commissioners' chief architect, Mr. J. Dalgliesh L. Easton, Tower-place, for a new dock warehouse.

MOFFAT.—EXTENSIONS.—Plans prepared for new extension to "Moffat Academy" and also new gymnasium. The architect is Mr. John Hill, County Buildings, Dumfries.

MONTROSE.—HOUSES, ETC.—The T.C. has agreed to borrow £3,000 for 15 houses in Ferry-street, and £38,000 for houses at North-street, Christie's-lane, and Rossie Island.

MOTHERWELL - WISHAW. — OFFICES. — New £30,000 offices, etc., are to be erected for Messrs. Colville, Ltd. Mr. Alexander Cullen, Cedzow-street, Hamilton, is the architect.

BUILDING TRADE WAGES IN SCOTLAND

Following are grade rates authorised by the Scottish N.J.C. from April 1. Every endeavour is made to ensure accuracy, but we cannot be responsible for errors that may occur.

Grade Classification	A	A^1	A^2	A^3	B	B^1
Craftsmen	1/8	1/7½	1/7	1/6½	1/6	1/5½
Labourers	1/3	1/2¾	1/2¼	1/2	1/1½	1/1¼

Aberdeen	A	Dumfriesshire	A^2	Inverness	*	Perthshire	A^2
Ayrshire	A	Dundee	A	Inverurie	A^1	Peterhead	A^1
Banff	B	Dunoon	A	Kincardineshire	A^2	Renfrewshire	A
Berwickshire	A^2	East Fife	A	Kinross-shire	A	Rothesay	A
Bridge of Allan	A	East Lothian	A	Lanarkshire	A	Roxburghshire	A^2
Broughty Ferry	A	Edinburgh	A	Midlothian	A	St. Andrews	A
Clackmannanshire	A	Fifeshire	A	Monifieth	A	Selkirkshire	A^2
Doune	A	Forfarshire	A^2	Moray and Nairn	B	Stewartry	A^2
Dunblane	A	Glasgow	A	Newport	A	Stirlingshire	A
Dumbartonshire	A	Greenock	A	Peeblesshire	A^2	Stornoway	A^2
Dumfries	A^1	Hamilton	A	Perth	A	Tayport	A
						West Lothian	A

* This town has its own rates: Masons, 1/6; Carpenters, 1/6; Slaters, 1/6; Plumbers, 1/6½; Plasterers, 1/7, but 1/8 is paid owing to the scarcity at present; Painters, 1/6; and Labourers, 1/1½.

The information given in this table is copyright. Rates of wages in England and Wales are given on page 1244.

GLASS.

ENGLISH SHEET GLASS IN CRATES OF STOCK SIZES.

ORDINARY GLAZING QUALITY AND SELECTED GLAZING QUALITY.

per ft. super		per ft. super.	
18 oz. O.Q.	2½d.	32 oz. O.Q.	5½d.
18 " S.Q.	2¾d.	32 " S.Q.	6¼d
24 " O.Q.	3¼d.	Obscured Sheet, 18 oz.	3d.
24 " S.Q.	3¾d.	" " 24 "	4¼d.
26 " O.Q.	3⅝d.	Fluted .....21 "	9d.
26 " S.Q.	4¼d.	Em'lld 18 oz.,5¼d.,24oz.	6¾d.

Extra price according to size and substance for squares cut from stock.

ENGLISH ROLLED PLATE AND FIGURED CATHEDRAL, ETC., IN CUT SIZES.

	Per ft.
Rolled plate, ¼ in.	5½d.
Rough cast double rolled, ⅜ in.	6¾d.
Rough cast double rolled, ½ in.	6¾d.
Figured rolled, etc., white	6¾d.
Figured rolled, etc., tinted	9¾d.
Rolled Sheet	6d.
White rolled cathedral	6d.
Tinted rolled cathedral	8¾d.

Rolled plate is the same price as rough cast double rolled.

	Per ft. s. d.
Reeded, Broad Reeded, Cross Reeded and Chevron Reeded, ¼ in. thick	0 10½
Wire Rolled, ¼ in. thick	0 9½
Wired Cast, ¼ in. thick	0 9½
" Calores " Sheet, 21 oz.	2 6
" 32 oz.	4 0
" Cast, ¼ in. thick	0 10
" " ⅜ in. thick	1 0
" " ½ in. thick	1 2

"VITA" GLASS.

Clearsheet—not exceeding 1 foot	1 0
" 2 feet	1 3
" over 2 feet.	1 9
Polished plate not exceeding 1 foot	1 6
" 2 feet	3 0
Cathedral—not exceeding 1 foot	1 0
" larger size.	1 6
Horticultural Sheet and Cathedral "Vita" Glass Sizes up to 24 inches by 18 inches or not exceeding 3 feet.	1 0
3/16 in. Wired Georgian Design. Sizes up to 96 inches long by up to 24 inches wide.	2 6

LEAD, &c.

(Delivered in London.)	Per ton. £ s. d.
LEAD.—Sheet, English, 4 lb. and up	22 10 0
Pipe in coils	23 0 0
Soil pipe	27 10 0
Compo pipe	29 5 0

NOTE.—Country delivery, 20/- per ton extra, lots under 3 cwt. 4/- per cwt. extra and over 3 cwt. and under 5 cwt., 2/6 per cwt. extra. Cut to sizes, 4/- per cwt. extra.

Old lead, ex London area, at Mills ..... per ton	£12 5 0

NEWTON.—INSTITUTE.—A new miners' welfare institute is to be erected on a site adjacent to the present institute building at £3,200. Mr. John Dunn, F.R.I.B.A., 31, Greenlees-road, Cambuslang, is the architect.

RENFREWSHIRE. — HOUSES, ETC. — The County Dean of Guild Court has passed the following plans: C.C., police offices, garage, and constable's house at Cross-roads, Houston; Lawrence Building Co., Ltd., Glasgow, 25 five-apartment houses at Clarkston-road, Stamperland, Clarkston.

RUTHERGLEN. — HALLS. — Plans in hand for new schools and halls, the architects being Messrs. Miller and Black, 132, West Regent-street, Blythswood, Glasgow.

STEPPS. — SCHOOL. — Plans in hand for alterations and additions to the primary school, the architect being Mr. John Stewart, Albert-street, Motherwell, Wishaw.

STIRLINGSHIRE.—SCHOOL. — The E.C. have agreed to erect a new infants' school in Stirling-road, Kilsyth.

TENDERS ACCEPTED

Anniesland.—Super cinema at Knightswood. Charles MacNair & Elder, architects, 274, St. Vincent-st., Blythswood, Glasgow:—Excavation, brick and building—*R. Corbett, Glasgow; joinery, carpentry and ironmongery—*Lawson & Co. (Govan), Ltd., Govan; steel construction—*Redpath, Brown & Co., Ltd., Glasgow; plumber and sanitary engineering—*MacCulloch & Giffen, Glasgow; slater, roughcasting and cement works, etc.—*P. Whyte & Co., Ltd., Glasgow; fireproof floors—*Siegwart Fireproof Flooring Co., Ltd., Glasgow.

Glasgow.—Reconstruction and additions in Renfield-st. and St. Vincent's-ln. John Baird & James Thomson, architects, 150, Holland-st., Blythswood:—Demolition, brick and building—*J. Emery & Co., Ltd., Glasgow.

Glasgow.—Painting 290 houses at Mankenfield-rd. William McNab, Housing Architect:—*MacLean & Speers, Ltd., Glasgow, £2,054 19s. 10d.

Glasgow.—Janitor's house, etc., in connection with the new Henswoodhill public school, for Corporation. Waddell & Inglis, architects, 220, Bath-st., Blythswood:—Excavation, brick and building—*Wilson Bros. (Builders), Ltd., Possilpark, £1,252 19s. 9d.; joinery, carpentry and ironmongery—*S. S. Stark & Co., Ltd., Bridgeton, £505 18s. 3d.; plumber and gas fitting and allied works, etc.—*MacCulloch & Giffen, Glasgow, £126.

Glasgow.—Boundary walls, drains, roads and other services at the new aero-engine factory to be erected at the Scottish Industrial Estate, Hillington, Glasgow, for Rolls-Royce, Ltd.:—*Sir Lindsay Parkinson & Co., Ltd., London; structural steel—*Redpath, Brown & Co., Ltd., Glasgow. (Estimated cost £250,000.)

Netherlee.—Houses, off Willenwood-drive. James Taylor, architect, 220, West Regent-st., Blythswood, Glasgow:—Excavation, brick and mason—*MacTaggart & Michael, Ltd., Glasgow.

Paisley.—New Mossvale school and reconstruction and additions to the present Mossvale school and also of a new house for janitors. William Brown, architect, 9, Gilmour-st., The Cross. Donald Dewar, quantity surveyor, Barton's-bldgs., 28a, High-st.:—Excavation, brick and building—*J. Crawford, Potterhill. Slater—*J. Gemmell & Co., Paisley. General outside cement works, etc.—*D. S. Lang & Co., Ltd., Paisley. Steel construction—*W. Baird & Sons, Ltd., Annisland, Glasgow. Joinery, carpentry and ironmongery—*W. Gibson & Co., Ltd., Paisley. Steel casements and windows, etc.—*Rouse Bros. & Co., Ltd., Liverpool. Glazing and allied works, etc.—*Norman Ferguson, Paisley. Plumber and sanitary engineering—*J. Kilpatrick & Son, Ltd., Paisley. Asphalte—*Pirie & Co. (Paisley), Ltd., Paisley. Painter—*County of Renfrew District Labour Dept., Paisley. Plaster, lathing—*D. S. Lang, Ltd., Paisley. Electrical fittings and installation, etc.—*J. Bell & Sons, Ltd., Paisley. Heating engineering and installation, etc.—*J. Boyd & Sons, Ltd., Paisley. Tar macadam works in playgrounds, etc.—*Pirie & Co. (Paisley), Ltd., Paisley. Iron gates, railings, and allied works, etc.—*D. Clark & Sons, Ltd., Parkhead.

Renfrew.—Houses at West Candren-rd., Walkinshaw. Norman MacFadyen, architect and quantity surveyor, 36, Julia-drive, Bearsden:—Excavation, brick and building—*J. Lawrence & Co., Ltd., Glasgow; plumber and sanitary engineering—*J. Y. Symington & Co., Ltd., Govanhill; plaster and lathing—*A. MacKellar, Glasgow; slater and roughcasting, etc.—*A. C. Whyte & Co., Ltd., Pollokshaws; joinery, carpentry and ironmongery—*Lawrence Building Co., Ltd., Glasgow; painting and glazing—*J. Chisholm & Son, Govan; electrical fittings and installation, etc.—*Kenneth MacAlpine & Co., Ltd., Govanhill; iron railings and gates—*P. & R. Fleming & Co., Ltd., Glasgow.

Scotland (H.M.O.W.).—Tenders accepted during week-ending June 27:—Carstairs Criminal Lunatic Asylum—tar macadam surfacing of service roads, Darroch & Newell, Ltd., 1, Locks-st., Coatbridge. Royal Air Force Volunteer Reserve, 1, Princes-court, Buchanan-st., Glasgow—alterations, J. Morrison & Sons (Glasgow), Ltd., 1009, London-rd., Glasgow.

TENDERS

The Editor welcomes authentic information for this feature from architects, surveyors or contractors. Items should reach 4, Catherine-street, Aldwych, W.C.2, not later than Wednesday morning.

* Denotes *accepted*.
† Denotes *provisionally accepted*.
‡ Denotes *recommended for acceptance*.
§ Denotes *accepted subject to modification*.
¶ Denotes *accepted by H.M. Government departments*.

Amble. — Fire station, for U.D.C.:—*R. & G. Brown, Amble, £423.

Anglesey.—School house at Llanerchymedd, for E.C. J. E. Rees, L.R.I.B.A., County Architect, Llangefni:—*Jones Bros., 24, High-st., Llanerchymedd, £719 5s.

Aspatria.—57 houses, for North-Eastern Housing Association, Metrovick House, Northumberland-rd., Newcastle-on-Tyne. S. Mann, architect, 28, Lowther-st., Carlisle:—Builder—*J. Atkinson, Brunswick-rd., Penrith. Roads and sewers—*T. Armstrong, Ltd., Saw Mills, Cockermouth.

Bakewell.—Sewerage and sewage disposal works at Chelmorton, for R.D.C. Brady & Partington, chartered civil engineers, Chapel-en-le-Frith. Quantities by engineers:—

Thos. Beighton, Ltd., Chesterfield	£2,923 8 5
Z. & W. Wade, Whaley Bridge	2,826 11 1
‡Geo. H. Graham, District Bank-chambs., Market-st., Huddersfield	2,249 14 3

Berkhamsted.—Research laboratories, offices, etc., High-st., for Cooper, McDougall & Robertson, Ltd. H. P. G. Maule, F.R.I.B.A., architect, 12, Stratford-pl., Oxford-st., W.1:—*T H. Kingerlee & Sons, Ltd., Queen-st., Oxford.

Birmingham.—Factory in Warwick-rd., Greet, for Brook Tool Manufacturing Co., Ltd.:—*Lewis Gorton & Son, Ltd., 60, Alfred-st., Sparkbrook, Birmingham.

Birmingham. — Decontamination stations at various public works depots, for T.C.:—*Fitter & Sons, Ltd., Stratford-st., Camp Hill, Birmingham.

Birmingham.—Factory and offices, Edgemund-av., Tyburn, for G. H. Hughes, Ltd. H. Bloomer & Son, architects, 14, Temple-st., Birmingham:—*Percy W. Cox, Ltd., Grove-la., Handsworth, Birmingham.

Birmingham.—Rebuilding "Coach and Horses" Inn, Mary-st., Balsall Heath, for Holt Brewery Co., Ltd., Holt-st. J. P. Osborn & Son, architects, 95, Colmore-row:—*C. Green & Sons, Ltd., 132, Monument-rd., Birmingham.

Bootle.—Widening and strengthening bridge No. 7 nr. Southport-rd., for L.M.S. Railway Co., Ltd. W. K. Wallace, chief engineer, Euston, N.W.1:—*Demolition & Construction Co., Ltd., Neville House, Page-st., S.W.1, £8,982.

Ealing.—Works for T.C.—

Construction of trenches:

	Horsenden. £ s. d.	Perivale. £ s. d.	Wood End. £ s. d.
E.Knifton,Ltd.	‡1,858 19 0	1,252 18 0	2,875 3 0
Anti-Bomb Constructions, Ltd.	1,841 0 0	*1,246 0 0	2,842 10 0
A. Robinson	1,856 2 0	1,398 5 0	2,650 16 0
P. Bilton,Ltd.	1,757 14 0	1,398 2 0	2,497 7 0
Wates, Ltd.	1,606 9 0	1,292 12 0	2,348 2 0
Parr-Head & Clements Knowling, Ltd.	*1,567 0 0	1,277 0 0	*2,287 0 0

Structural work in connection with main report centre in Copley Dene:

*W. J. Dickens	£770 0 0

Temporary classrooms at Northolt school:

F. D. Hidden, Brentford	£1,049 0 0
Duncan, Tucker (Tottenham), Ltd., Tottenham	986 0 0
C. & T. Ware, Greenford	765 0 0
E. Thomas & Son, Hanwell	763 0 0
*J. J. McGowan, Harrow	669 0 0

Structural alterations at Ealing and Brentford and Chiswick hospital:

*Ealing B.E.	£400 0 0

Electrical works:

Cox & Hembrow, Ltd., Ealing	£119 19 3

Trenches at schools:

	Coston. £ s. d.	St. John's. £ s. d.	Northolt. £ s. d.	Ravenor. £ s. d.	Selborne. £ s. d.
A. Brown, W.13	4,764 19 0	1,035 17 0	1,230 15 0	1,367 3 0	1,233 10 0
Sparkes Bros., Feltham	3,287 12 0	741 5 0	856 15 0	863 10 0	881 15 0
P. Bilton, Ltd., W.1	3,070 7 0	666 5 0	822 15 0	815 10 0	826 5 0
Parr-Head & Clements Knowling, Ltd., W.5	*2,787 0 0	647 0 0	717 0 0	747 0 0	707 0 0
A. Robinson Harrow	3,296 8 0	784 0 0	666 5 0	788 9 0	680 0 0
Anti-Bomb Constructions, Ltd., S.W.1	3,119 0 0	703 0 0	750 0 0	810 0 0	607 0 0
J. Dalziel, Ltd., Oxford	1,667 17 0	*596 17 0	633 2 0	682 15 0	528 2 0
A. Hirst, Wembley	2,570 3 0	612 10 0	*556 15 0	*618 16 0	*475 0 0

Erection of cleansing stations:

	Southern Wks. £	Northern Wks. £	Northolt. £	Greenford £
P. Bilton, Ltd., W.1	4,047	2,588	3,359	6,757
Davis Contractors, Ltd., N.W.6	4,049	2,590	3,279	6,065
Nox, Ltd., W.1	3,515	2,612	3,210	6,030
Evan Thomas & Sons, Hanwell	3,659	*2,198	3,048	5,526
A. & B. Hanson, Southall	3,825	2,385	3,200	5,349
W. J. Dickens, W.5	3,600	2,280	3,050	4,950
Raglan Building Co., Wembley,	*2,888	2,320	*2 830	*4,397

Bootle.—Extensions to works in Linacre-la., Hawthorne-rd., for Liverpool Electric Cable Co., Ltd. J. Paley Parrish, architect, "Woodgarth," Broad-rd., Sale:—Builders—*W. Anderton & Co., Ltd., Broughton, Manchester. Steelwork—*Robinson & Kershaw, Ltd., Manchester. Roof covering—*Wolverhampton Corrugated Iron Co., Ltd., Ellesmere Port.

Brighton.—10 small flats in two storeys in Warwick-st., Brighton, for T.C.:—*E. B. Hayward, Ltd., West Worthing, £2,916 (amended tender).

Burton-on-Trent.—Extensions to omnibus garage at Horninglow-st., for T.C. G. Moncur, A.M.I.C.E., B.S.:—*Thos. Lowe & Sons, Ltd., Curzon-st.

Cannock.—Bakery, Cannock-rd., for Taylors (Cannock), Ltd., Central Bakeries. S. Harrison, architect, "Aldersyde," Shoal Hill:—*J. & F. Wootton, Ltd., Pinfold, Bloxwich, Walsall.

Colwyn Bay.—Extension to fire station, for T.C.:—*E. Cubborn, Colwyn Bay, £135.

Coventry.—Branch bank, High-st., for District Bank, Ltd., Spring-gdns., Manchester. Parker & Plowman, architects, 2, The Quadrant, Warwick-rd.:—*H. Darbyshire, Burnsall-rd.

Coventry.—Reconstruction of Baginton-rd., Clifford Bridge-rd., Four Pounds-av., Holyhead-rd., Sir Henry Parkes-rd., Scots-la. and Quarryfield-la., for T.C. E. H. Ford, City E.:—*Direct labour, £72,000.

Dartford.—Works, for T.C.:—
Deepening and permanent lining of trenches in the Central and Hesketh-pks.:—

Tileman & Co., Ltd.	£668 0
Hall & Co., Ltd.	630 0
Kent and Sussex Contractors, Ltd.	628 0
Ben Holroyd & Sons, Ltd.	610 8
Chittenden & Simmons, Ltd.	596 0
C. K. Davis, Ltd.	479 0
W. Mitchell	420 0
W. J. Draper & Son	398 0
J. G. Cronk (Streatham), Ltd.	385 4
*Road Maintenance & Stone Supply Co., Ltd.	364 0

Greenhouse and frame at Central Park:—*R. Halliday & Co., Ltd., Manchester, £550 15s.

Darton.—Outside painting of 38 houses at Greenside, for U.D.C. Cecil Fieldsend, Housing Agent:—*James J. Marfleet, Clarkson-st., Worsbro' Dale, £55 5s.

Devizes.—Alterations and additions to dressing-rooms at swimming pool, for T.C. A. W. Jakeway, B.S. Quantities by B.S.:—

F. Rendell & Sons, Ltd., Devizes	£753
*L. Maslen & Sons, Ltd., Devizes	712

Doncaster.—Painting, etc., three wards at isolation hospital, Conisborough, for Doncaster and Mexborough Joint Hospital Board. Dr. W. J. Maclure, medical superintendent:—*Griffins, Washington-st., Mexborough, £125.

Dunstable.—Repairs, painting and decorating administrative block at Isolation Hospital, for Dunstable and District Hospital Joint Committee. H. Pickering, M.Inst.Mun. & Cy.E., F.R.S.A., 73, West-parade:—

H. C. Janes, Ltd., Luton	£266 6
Hardy & Parkins, Dunstable	188 9
F. Foster, Dunstable	185 0
F. D. Cox, Kensworth	148 18
W. Summerfield & Son, Dunstable	139 0
Purser & Furlong, Leighton Buzzard	128 0
*Balderson & Dickinson, Church-st., Keighley	105 0

Eccles.—Painting work at (a) Clarendon-rd. council school and education offices; (b) All Saints' R.C. school, for E.C. T. Elce, B.S.:—(a)*Lomax Bros., Ltd. Ellbee House, Albert-st., £327; (b)*T. W. Bagley, 429, Chester-rd., Old Trafford, Manchester, £105.

Exeter.—Rebuilding St. David's Head Hotel, 113, Bonhay-rd., for A. E. Appleton. Lucas & Roberts, architects, 27, Dix's Field, Exeter:—*A. E. Eversleigh, Richmond-rd., Topham, Exeter.

Finsbury.—Works, for B.C.:—Redecoration of large hall and town clerk's department at Town Hall—‡Clark & Fenn, Ltd., Charlotte Studios, Clapham, S.W., £469 8s. 8d.; external painting at Merlin-st. baths—‡Edward Proctor & Sons, Rockmount-rd., S.E.18, £134.

Friern Barnet.—External redecoration, 40 houses, Halliwick-rd., for U.D.C.:—‡Toms & Bishop, 306, Park-rd., Hornsey, N.8, £192 10s.

Gipping.—Ten houses at Haughley, for R.D.C.:—*H. Brand, £3,369 2s. 9d.

Hackney.—Sub-stations, for B.C.:—*J. Jarvis & Sons, Ltd.—King Edward's-rd., £765, and Stamford-hill, £747.

Haltwhistle.—Maternity ward as extensions to Haltwhistle and District War Memorial Hospital, for Board of Management. Oliver & Leeson, architects, 14, Ellison-pl., Newcastle-on-Tyne :—Contractors—*H. Williams & Sons, Hencotes, Hexham. Plumber—*H. Irving, Fairhill, Haltwhistle. Slater—*M. Charlton & Sons, Station-rd., Hexham. Painter—*A. Snowball, Haltwhistle.

Hastings.—Rebuilding branch premises, for Lloyds Bank, Ltd. Callow & Callow, architects, 47, Havelock-rd., Hastings. Hale & Son, quantity surveyors, 6, Queen Anne's-gate, S.W.1:—*J. Crewdson, Smallfield-rd., Horley.

Haverfordwest.—Public convenience at Broad Haven, for R.D.C. :—

W. G. Phillips, Haverfordwest	£481 15 2
R. Warlow, Milford	445 0 0
W. H. Fortune & Son, Haverfordwest	441 10 0
W. J. Rees, Haverfordwest	425 10 6
*G. O. Thomas & Sons, Haverfordwest	409 10 0

Hindley.—Works, for U.D.C. O. P. Abbott, S. :—Painting outside Hindley Green council school. *J. Peters & Sons, Atherton-rd., Hindley Green; insides of Hindley C. of E. school and Castle Hill school. *W. Stott & Sons, Ladies-ln., Hindley; inside of portion of Council Offices, *W. Wignall, 50, Millgate, Wigan.

Holborn.—External cleansing, painting and other works at town hall and public library, for B.C. :—‡Cole, Loasby & Co., Ltd.

Hornsey.—Works, for T.C. :—Internal decorations, Muswell Hill estate. ‡G. Jones & Son, Kensington; External decorations, Hornsey estate. ‡Toms & Bishop, Hornsey; Fencing, The Grove and Wood-ln., ‡Matthew & Co.

Hornsey.—Reconstruction of carriageway, including removal of existing tramways, of Archway-rd., Highgate, for T.C. :—*A. Robinson, Kenton-rd., Harrow, £22,070.

Huddersfield.—First section of Digley reservoir, Digley Brook, Holme Valley, for T.C. G. H. Hill & Sons, consulting engineers, 51, Mosley-st., Manchester :—*Edward Nuttall, Sons & Co. (London), Ltd., Grosvenor-gdns., S.W.1. (Estimated cost £750,000.)

Kensington.—Works for B.C. :—Re-glazing lantern light over ladies' first-class swimming bath. *British Challenge Glazing Co., Grove Glass-wks., Marshgate-ln, Stratford, E.15, £166 4s. 4d.; Demolition of —7, St. Mark's-gr., *London Demolition Co., Ltd., £575-577, London-rd., Isleworth, £144; Supplying and fixing suitable iron railings with necessary gates at Northolt playing fields, *T. W. Palmer & Co., of Merton Abbey Iron-wks., S.W.19, £107 4s. 6d.; Electric wiring remainder of trenches in borough, *Bate Electrical Co., Ltd., £421 17s. 2d.

Kildare.—648 cottages, for Board of Health :—*C. & K. Murray, £197,397.

Kingsclere and Whitchurch.—Houses, for R.D.C. J. W. Simcox, Building S., Kingsclere :—

4 houses, the Rank, St. Mary Bourne—	
D. Cook, Oakley	£1,782
Sherfield Bros., Sherborne St. John	1,929
Berry & Knight, Reading	1,495
Morley & Hezel, Hungerford	1,630
*L. G. Durnford, Newbury	1,450
8 houses, Tadley—	
Berry & Knight, Reading	£3,164
Rodbard Bros.	3,618
Sherfield Bros., Sherborne St. John	4,178
W. Meadham, Kingsclere	3,299
D. Cook, Oakley	3,880
A. Blake, Padworth	3,750
Morley & Hezel, Hungerford	3,440
*R. Goddard, Tadley	3,193

Leamington Spa.—Rebuilding the "Joiners' Arms," Shrubland-st., for H. E. Thornley, Ltd., Radford Hall Brewery. F. G. Cundall, architect, The Parade :—*Powles, Simpson Co., Ltd., 104b, Warwick-rd., Kennilworth.

Leicester.—Pithead baths, Snibston, for Miners' Welfare Central Fund Committee. J. H. Forshaw, chief architect, Romney House, Tufton-st., London, S.W.1 :—*Orton & Co., London-rd., Coalville, £15,879.

Letchworth.—Extensions to Letchworth and District Hospital, Baldock-rd., for Board of Governors. J. C. Tickle, architect, 16, William-way :—Building —*J. L. White, Bridge-rd., Letchworth; heating—*C. S. Thompson (Letchworth), Ltd., Letchworth.

Lewisham.—Works, for B.C. :—24 shelters, each of different type—

In brickwork—	
Anti-Bomb Constructions, Ltd.	£1,736 11 4
R. C. Hammett (Builders), Ltd.	1,621 4 7
H. & J. Taylor (Contractors), Ltd.	1,507 0 0
G. Percy Trentham, Ltd.	1,455 8 6
Campbell & McGill	1,442 4 0
Henry Woodham & Sons, Ltd.	1,388 1 6
Mears Bros. (Contractors), Ltd.	1,329 0 0
Commercial Structures, Ltd.	1,256 7 3
Tileman & Co., Ltd.	1,129 0 0
Clark & Partners, Ltd.	1,080 0 2
*Corolite Construction, Ltd.	956 2 0
In concrete—	
Alfred Lockhart, Ltd.	1,633 0 0
W. Norman & Son, Ltd.	1,551 17 10
Wates, Ltd.	1,475 10 0
Samuel Wright & Co., Ltd.	1,373 3 3
Repainting exteriors, 12 blocks of flats—	
*C. J. Manning (Builders), Ltd., Stratford (In lieu of previous tender.)	£574
Making trenches permanent—	
*H. Woodham & Sons	£4,209 14 3
Filling in trenches—	
*H. & J. Taylor (Contractors), Ltd.	£137 1 8

Building work at various depots for A.R.P. schemes—

	Wearside-rd. depot.	Downham depot.	Woodyates-rd. depot.
Thomas & Edge, Ltd.	£6,490	£5,250 0	£1,980 0
John Mowlem & Co., Ltd.	6,300	5,150 0	2,050 0
Mears Bros. (Contractors), Ltd.	5,970	4,501 10	1,834 10
Henry Kent (Builders), Ltd.	5,553	4,198 0	1,703 10
Peter Lind & Co., Ltd.	5,153	4,430 0	1,840 0
*H. & J. Taylor (Contractors), Ltd.	5,181	3,824 0	1,568 0
Borough Engineer's estimate	5,324	3,947 0	1,670 0

Wates, Ltd., separate figures not given—total £11,501.

Lincoln.—40 blocks of maisonettes, for Melville & Webber, 40, Pall Mall, London, S.W.1. L. W. Barnard & Partners, architects, 13, Imperial-sq., Cheltenham :—*Super Homes (Wolverhampton), Ltd., 7, St. Mary's-st., Bridgnorth, £45,000.

Liverpool.—"Alt Park" Hotel, on Alt Park estate, Maghull, for Alt Park Estates, Ltd., 14, Dale-st. A. E. Shennan, F.R.I.B.A., architect, 17, North John-st. :—*Roberts & Sloss, Ltd., Baker-st., Liverpool. (Cost £18,000.)

¶London (H.M.O.W.).—Tenders accepted for week ended June 22 :—Removal of files, Wm. Whiteley, Ltd., Depository, Avonmore-rd., W.14. Chairs, mahogany—B. North & Sons, West Wycombe. Blue Band earthenware—W. Adams & Sons, Ltd., Tunstall, Stoke-on-Trent; Mintons, Ltd., China Wks., Stoke-on-Trent; Pountney & Co., Ltd., The Bristol Pottery, Fishponds, Bristol, and Wood & Sons, Ltd., Trent and New Wharf Potteries, Burslem, Stoke-on-Trent. Earthenware—W. Adams & Sons (Potters), Ltd., Tunstall, Stoke-on-Trent; G. L. Ashworth & Bros., Ltd., Broad-st., Hanley; Booths, Ltd., Church Bank Pottery, Tunstall, Stoke-on-Trent; G. Jones & Sons, Ltd., Crescent Potteries, Stoke-on-Trent; C. E. Bevington, Ltd., Buchanan-bldgs., 24, Holborn, E.C.1; Mintons, Ltd., China Wks., Stoke-on-Trent; Soho Pottery, Ltd., Elder Wks., Cobridge, Stoke-on-Trent, and Wood & Sons, Ltd., Trent and New Wharf Potteries, Burslem, Stoke-on-Trent. Card Tables—Amatacraft, Ltd., Anne-rd., Handsworth, Birmingham, 21, and M. A. Partridge, Ltd., 135, Shepperton-rd., London, W.1. Coleshill-st. (Birmingham) Branch Post Office—erection, H. Dare & Son, Ltd., Alum Rock-rd., Ward End, Birmingham, 8. Burton-on-Trent Telephone Repeater Station—erection, C. H. Reedman, Ltd., Northfield-av., Long Eaton, Nottingham.

Colchester Area—A.R.P. work, B. R. Broom, Butt-rd., Colchester. Port Talbot Area—A.R.P. work, Morgan, Cox & Sons, Courtland-bldgs., Port Talbot. Furniture and effects—Joseph May, Ltd., 6, Howland-st., W.1. Slate—James Hustler & Son, Ltd., White Lund, Morecambe. Steel card index tables—Sankey Sheldon (Harris & Sheldon, Ltd.), 46, Cannon-st., E.C.4. Linen—C. D. Willoughby & Co., Ltd., 10, Trump-st., Lawrence-ln., E.C.2. Moss Side State Institution, Maghull—construction of drains, ducts, walls, roads, etc., The Unit Construction Co., Ltd., Bentham-dr., Broadgreen, Liverpool, 16. Bishopton Royal Ordnance Factory—aluminium drying trays, The Aluminium Plant & Vessel Co., Ltd., Point Pleasant, Wandsworth, S.W.18. Bewdley (Worcs) Telephone Exchange—erection, Haughton Bros., 2, Palace-yard, Worcester. New police building, Whitehall, S.W.1—installation of pneumatic despatch tube service, The Lamson Engineering Co., Ltd., 132, Cheapside, E.C.2. Wythall Telephone Exchange—erection, John Evans & Son, Newtown, Malvern. Table standards—Holroyd (Glassware & Lighting), Ltd., 22, Newsum-st., W.1. Suction hose—The British Tyre & Rubber Co., Ltd., Thames House, Millbank, S.W.1. Sheets—Ritchie & Eason, Ltd., 26, Dickinson-st., Manchester, and Ashton Bros. & Co., Ltd., 29, Portland-st., Manchester, 1. Paper trays—A. G. Matthews, Ltd., Redcliffe-hill, Bristol, 1. Hull R.A.F.V.R.—adaptations, G. Anson, 39, Brunswick-av., Hull.

DON'T TENDER UNSUCCESSFULLY

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Steel postmen's lockers—Waddells (Stratford Steel Equipment), Ltd., Millmarsh-ln., Brimsdown. School desks—Wake & Dean, Ltd., Yatton, nr. Bristol. Writing-tables—Macdona (Shopfitters), 161, Parchmore-rd., Thornton Heath. Mahogany stores cupboards—A. G. Farmer & Sons, Ltd., Winterstoke-rd., Bedminster, Bristol. Pillow slips and sheets—Stott & Smith, Ltd., 82, George-st., Manchester, 1. Sheets—Thos. Johnson & Sons, Ltd., Dark-ln., Chancery-ln., Ardwick, Manchester, 12; Joshua Hoyle & Sons, Ltd., 50, Piccadilly, Manchester, 1, and James Findlay & Co., Ltd., 22, West Nile-st., Glasgow. Pillow slips—J. Hoyle & Sons, Ltd., 50, Piccadilly, Manchester, 1, and Thos. Johnson & Sons, Ltd., Dark-ln., Chancery-ln., Ardwick, Manchester, 12. Glascoed R.O.F.—vacuum cleaning plants, The Visco Engineering Co., Ltd., Stafford-rd., Croydon. Rosyth Mechanical Training Establishment—heating and hot water services—David Thompson & Sons, Ltd., Barwise House, Lowther-st., Carlisle. Haymeads Institution, Bishops Stortford, Herts—erection emergency hospital buildings, A. E. Symes, Ltd., Carpenters-rd., Stratford, E.15. Hickory levers—Rudders & Paynes, Ltd., Chester st., Birmingham.

Glass mustard pots, salt pourers and pepper sprinklers—The Anglo-French Manfg. Co., Ltd., 2-8, Honduras-st., Old-st., E.C.1. Carpets and rugs—The Carpet Manfg. Co., Ltd., Kidderminster, and T. F. Firth & Sons, Ltd., Clifton Mills, Brighouse. Glascoed Royal Ordnance Factory—vapour exhaust plants, etc., Davidson & Co., Ltd., Central House, 45, Kingsway, W.C.2. Glascoed Royal Ordnance Factory—fume exhaust plants, Thermotank, Ltd., Helen-st., Govan, Glasgow, S.W.1. Chorley R.O.F.—machines for cleaning pdr. shells, Adcock & Shipley, Ash-st., Leicester. Bishopton R.O.F.—heater units, Heat & Air System, Ltd., 172, Buckingham Palace-rd., S.W.1. Bishopton R.O.F.—false bottoms, acid stoneware vats, The Bourtreehill Coal Co., Ltd., Dreghorn. Sutton Engineering Depot Garage—heating and hot water services, H. C. Goodman, Ltd., Caversham Bridge Foundry, Reading. Nottingham Engineering Staff and Stores—heating and hot water services, Young, Austen & Young, Ltd., 22, Park-row, Nottingham.

¶London (Admiralty).—Embankments, etc., at Pembroke, British Projects, Ltd., 17, Shaftesbury-av., London, W.1.; engineering work of magnitude, Fishguard, Pauling & Nuttall, 22, Grosvenor-gdns., S.W.1; reconditioning football ground, Chatham, W. H. Gaze & Sons, Ltd., 19-23, High-st., Kingston; supply dredging buckets, Portsmouth, Lobnitz & Co., Ltd., Renfrew.

¶London (War Office).—Amended contracts placed during week ended June 8 :—Hutments and flutted camps, Aldershot, G. H. Gibson & Sons, Ltd., High Wycombe; Blackdown and Deepcut, Y. J. Lovell & Sons, Ltd., Gerrards Cross; Woking, E. J. Logan, London, W.C.2; Aldershot, Limpus & Sons, Ltd., Kingston-on-Thames; Aldershot, R. Holford & Co., Ltd., Guildford; Catterick, Dunhill Bros., Leeds; Aldershot, Halse & Son, Ltd., London, S.E.; Clayton Barracks, Crosby & Co., Ltd., Farnham; Perham Down, A. J. Dunning & Sons, Weyhill; Portland, Harry Hibditch, Ltd., Martock; Portsmouth, R. J. Winnicott, Ltd., Portsmouth; Exeter, F. J. Stanbury, Plymouth; Devizes, Trowbridge, Salisbury and Warminster, Wort & Way, Salisbury; Londonderry, Courtney & Co., Belfast. Contracts placed during week ended June 22 :—Deysbrook—sheds, J. Gerrard & Sons, Ltd., Manchester. Weedon—reconstruction of roads and pavings, Asphalt & Public Works, Ltd., Birmingham. Ashford—workshop and garage, G. Wimpey & Co., Ltd., London, W.6. Rainford—piling, West Rotinoff Piling & Construction Co., Ltd., London, W.C.2. Aldershot—garages, Universal Housing Co., Ltd., Rickmansworth. Arborfield Cross—clothing to hutted camp hall, Haymills (Contractors), Ltd., London, W.6.

Hutted camps—Newcastle-on-Tyne, Sunderland, Midhurst and Steyning, Anglo-Scottish Construction Co., Ltd., London, S.W.1; Selby, Snaith, Doncaster, Gainsborough, Lincoln, Newark, Bingham, Bourne, Melton Mowbray and Oakham, Tarran Industries, Ltd., Hull; Sedgefield and Guisborough, F. Shepherd & Son, Ltd., York; Peterborough, Ramsey, Thrapston and Ely, Gee, Walker & Slater, Ltd., London, W.1; Bishop Stortford, Ware, Chelmsford and Waltham Abbey, Walter Lawrence & Son, Ltd., London, E.C.2; St. Neots and Royston, J. Willmott & Sons (Hitchin), Ltd., Hitchin; Rayleigh, F. R. Hipperson & Sons, Ltd., London, E.C.2; Strood and Gillingham, Kent & Sussex Contractors, Ltd., Erith; Dartford, Sevenoaks and Readcorn, W. F. Blay, Ltd., London, W.1; Reigate, Wates, Ltd., London, S.W.16; Crowborough and Horsham, Unit Construction Co., Ltd., London, W.C.2; Emsworth, Botley and Newport, I.O.W., E. H. Burgess, Ltd., London, S.W.1; Hythe, G. E. Wallis & Son, Ltd., Maidstone; Perth, P. Graham & Sons, Perth; Stirling, Spiers, Ltd., Glasgow; Inverness, Fort George and Aberdeen, D. C. Stewart, Aberdeen.

Colchester—construction of parade ground, F. Hutton & Son, Ltd., Colchester. Abbey Fields.

Reed Hall, Hyderabad Barracks and Meanee Barracks—main drainage to huts, Wm. F. Rees, Ltd., London, S.W.1. Dover—external services to hutting, Grummant Bros., Ramsgate. Shorncliffe, Dover and Canterbury, hutted accommodation, Universal Housing Co., Ltd., Rickmansworth. Chatham and Sheerness—concrete floors, Hurlingham Bungalow Co., Ltd., London, S.W.6. Various sites in Chatham area—external services, H. Goodsell, Maidstone. Millbank—hutments, W. J. Cearns, Ltd., London, E.15.

Ayr, Hamilton, Maryhill, Glencorse, Berwick, Redford and Dreghorn—huts, Tarran Industries, Ltd., Hull. Ayr and Redford—huts, James Jones & Son, Larbert. Maryhill—huts, Robert Howie, Dunlop. Redford and Dreghorn—huts, Stewart McIntyre, Edinburgh.

¶London (Air Ministry).—Contracts placed for week ended June 24:—Langham—preparation of landing ground, Bradshaw Bros., Leicester. Wyton—heating and hot water supply, Brightside Foundry & Engineering Co., Ltd., Birmingham. Hendon—alterations and additions, F. Troy & Co., Ltd., London. Hednesford—internal wiring, Lowdon Bros. and Co., Ltd., Dundee. Blackpool—alterations and additions to stadium, J. Ridyard & Sons, Ltd., Ashton-under-Lyne. Chigwell, Stanmore and Uxbridge—hutting, Watling, Ltd., Rochester. Cottesmore, Rutland—heating and hot water supply, Maddock & Wright, Leicester. Various stations—regional hutting, J. Gerrard & Sons, Ltd., Swinton, and Boulton & Paul, Ltd., Norwich. High Ercall—sheds, Furness Shipbuilding Co., Ltd., Middlesbrough. Sheds: Burton Wood, Dorman, Long & Co., Ltd., Middlesbrough; Llandow, Alex. Findlay & Co., Ltd., Motherwell; Colerne, Wright, Anderson & Co., Ltd., Gateshead-on-Tyne; Lyneham, Dawnays, Ltd., London; Kinloss, Lambhill Ironworks, Ltd., Glasgow; Hawarden, Sir William Arrol & Co., Ltd., Glasgow; Aston Down and Kirkbride, Cleveland Bridge & Engineering Co., Darlington; Colerne, Braithwaite & Co. (Engineers), Ltd., London; High Ercall, Head, Wrightson & Co., Ltd., Thornaby-on-Tees; Hullavington, John Booth & Sons, Ltd. Bolton; Kemble, Lambhill Ironworks, Ltd. Glasgow; Lyneham, P. & W. MacLellan, Ltd. Glasgow; Shawbury, Dorman, Long & Co., Ltd., Middlesbrough; Silloth, William Bain & Co., Ltd., Coatbridge.

London (M.W.B.).—Works, for Board:—

Carrying out flood prevention works at Old Ford pumping station:—*Works Dept., £335.

Buildings at Wansunt pumping station:—

A. E. Wright, Ltd.	£4,742	7	0
W. J. Draper & Son	4,733	8	7
Gough Cooper & Co., Ltd.	4,582	0	0
S. H. Alabaster, Ltd.	4,505	11	0
William Moss & Sons, Ltd.	4,238	19	9
John Mowlem & Co., Ltd.	4,135	19	3
Grace & Marsh, Ltd.	3,862	0	0
H. Friday & Sons	3,814	16	0
Corolite Construction, Ltd.	3,660	5	5
Ward Barton & Co., Ltd.	3,551	11	1
‡Walker (Tooting), Ltd.	3,513	0	0

Repainting about 600 yds. of iron railings and gates along frontage of Hampton works at Upper Sunbury-rd. from Clock Tower to "Karslake" engine-house:—*Works Dept., £175.

London.—Works for L.C.C.:—

Reconditioning of north-east block, St. Clement's Hospital, Poplar—	
R. J. Truscott, Ltd.	£8,481
E. A. Roome & Co., Ltd.	8,276
George Barker	8,129
George Keetch & Sons, Ltd.	8,058
C. J. Manning (Builders), Ltd.	7,787
Hansard, Ltd.	7,466
J. and C. Bowyer, Ltd.	7,342
Patman & Fotheringham, Ltd.	7,302
Haines & Warwick, Ltd., Seven Kings	£7,257 and 7,272
Charles S. Foster & Sons, Loughton	7,194
A. E. Symes, Ltd.	7,120
*W. H. Gaze & Sons, Ltd., 23, High-st., Kingston	6,933
(Architect's estimate £7,113.)	

Additional isolation and staff accommodation, Southern Hospital, Dartford—	
Foster & Dicksee, Ltd.	£66,593
Leslie & Co., Ltd.	64,614
R. J. Barwick, Dover	63,910
The Ashford Builders Co., Ltd.	63,198
J. & C. Bowyer, Ltd.	62,764
Walter Lawrence & Son, Ltd.	62,368
Thomas & Edge, Ltd.	62,287
C. Miskin & Sons, Ltd., St. Albans	61,947
J. W. Ellingham, Ltd., Dartford	61,900
William F. Blay, Ltd.	61,375
Prestige & Co., Ltd.	60,731
*Gee, Walker & Slater, Ltd., Fitzmaurice-pl., W.1	59,250
(Architect's estimate £61,620.)	

Installation of heating and hot-water supply apparatus, etc., in connection with provision of additional isolation and staff accommodation at South Eastern Hospital, New Cross—	
Comyn Ching & Co. (London), Ltd.	£12,520
W. G. Cannon & Sons, Ltd.	12,415
Heating Installations, Ltd.	11,837
Clark, Hunt & Co., Ltd.	11,806
Colley, Meikle & Co., Ltd.	11,741
J. & F. May	11,615
G. N. Haden & Sons, Ltd.	11,344
Norris Warming Co., Ltd.	11,222
The Fretwell Heating Co., Ltd.	11,195
Smeaton & Sons, Ltd., Holborn	11,160
H. J. Cash & Co., Ltd.	10,897
*Newman & Watson, Ltd., 45, Nottingham-pl., W.1	£10,199
(Chief Engineer's estimate £10,800.)	
Reconstruction of Cricketer's Bridge, Old Ford-rd., Bethnal Green—	
Howard Farrow, Ltd.	£9,568
Paterson & Dickinson, Ltd.	9,459
Matthew Shaw & Co., Ltd.	9,385
W. & C. French, Ltd., Buckhurst Hill,	8,782
West's Rotinoff Piling & Construction Co., Ltd.	8,754
Commercial Structures, Ltd.	8,724
Holst & Co., Ltd.	7,993
The Demolition & Construction Co., Ltd.	7,941
*H. C. Janes, Ltd., 25, Victoria-st., S.W.1	6,672
(Chief Engineer's estimate £8,447 18s.)	
Wiring and fittings for electric lighting in 898 existing houses, flats, etc., at Becontree (Dagenham area, No. 19 contract)—	
Archibald Meckhonik	£7,827
Davis Myer & Co., Ltd.	7,523
Evans & Shea, Ltd., Barking	7,381
E. & C. Champion, Sutton	7,024
City Electrical Co.	6,985
Ilford Electrical Co., Ltd., Ilford	6,803
Jacob, White & Co., Ltd.	6,744
Electrical Installations, Ltd.	6,697
Holliday & Son (Electrical), Ltd.	6,500
Newman & Watson, Ltd.	6,422
*Ryland's Electrical Co., Ltd., York House, Goodmayes-rd., Goodmayes	6,193
(Chief Engineer's estimate £7,036.)	

London.—Further covered accommodation at the Metropolitan Cattle Market, for City Corporation:—

(a) M. T. Shaw & Co., Ltd.	£3,375	0	
Boulton & Paul, Ltd.	3,349	0	
(a) Wright, Anderson & Co., Ltd.	3,300	0	
(a) Cargo Fleet Iron Co., Ltd.	3,299	10	
(a) Measures Bros. (1911), Ltd.	3,151	2	
(a) Harland & Wolff, Ltd.	3,120	15	
(a) (Less 2½ per cent.)			
‡F. Braby & Co., Ltd.	2,998	15	

Ludlow.—Extension of the Clee Hill water supply to Hill Top, Little Isle and Studley, for R.D.C.:—†— Benny, Newport, £1,289.

Macclesfield.—Gymnasium at King's School, off Coare-st., for Board of Governors. F. C. Sheldon, F.S.I., architect, King Edward-st.:—*Cooper Bros. (Builders), Ltd., Catherine-st., Macclesfield, £5,000.

Manchester.—W.I. railings and gates at Chorlton municipal high school for boys, Cavendish-rd., Chorlton-cum-Hardy, for E.C. Surveyor's Department, Education Offices:—*Staveleys, Ltd., Atherton.

Marsden.—Hotel, for Newcastle Breweries, Ltd., Newcastle. J. H. Morton & Son, architects, Martin's Bank-chams., South Shields:—*B. Peel, Ltd., East Mill Works, North Shields.

Middlewich.—Repairs and painting Sproston water tower, for U.D.C:—*Earl Bros., Kinderton-st., Middlewich, £235 18s.

Newark.—Licensed premises to be known as "Broadway" Hotel, Hawtonville housing estate, for Warwicks & Richardson, Ltd., Northgate. Plans by staff architect:—*J. Wright & Sons, 16, Whitefield-st., Newark.

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Newbury.—External repainting at various groups of houses, for R.D.C. E. G. Hampshire, S.:—54 houses—*W. Morris & Son, Northcroft-ln., Newbury, £145 15s. 20 houses—*L. E. Knight Chieveley, nr. Newbury, £62 10s.

Newbury.—20 houses at Southend, Cold Ash, for R.D.C. E. J. Hampshire, S.:—*J. T. Gibbs, Hungerford, £7,937 10s.

Newbury.—Twenty three-bedroom non-parlour type houses on Southend site at Cold Ash, for R.D.C.:—*J. T. Gibbs, £7,937 10s.

Northampton.—Chapel at General Hospital, for Board of Management of Northampton General Hospital. Sir John Brown & A. E. Henson, architects, 83, St. Giles-st.:—*H. Martin, Ltd., Thenford-st., Northampton.

North Shields. — Extensive alterations to "The Blyth and Tyne" Hotel. T. A. Page, Son & Bradbury, architects, 75, King-st., South Shields.—*Hastie Burton, Ltd., King-st., North Shields.

Norwich.—Covering over bullock yard at sewage farm, for T.C.:—*R. Stevenson, £315.

Oswestry.—(a) 16 houses at Weston Rhyn and (b) 10 houses at Gobowen, for R.D.C.:—*W. Gittins, Wrexham (a) £6,270 10s.; (b) £4,163. (Subject to M.H. approval.)

Paignton.—Conversion of Customs House to public conveniences, and conversion of boat stores to café and shops at Paignton Harbour, for U.D.C. E. and S., 23-25, Totnes-rd. Quantities by G. S. Harris & Partners, Paignton:—*J. Lloyd, Estates Office, Shiphay Park estate, Torquay.

Preston.—Painting council houses, for T.C. R. Williams, B.S.:—*Works Dept., £1,358.

Rawtenstall. — Structural alterations to branch bank, 13, Bank-st., for Yorkshire Penny Bank, Ltd., Infirmary-st., Leeds. Plans by resident architect:—*William Nicholson & Son (Leeds), Ltd., Prospect Saw Mills, Sheaf-st., Leeds.

Rawtenstall. — Branch bank on Bank-st., for Union Bank of Manchester, Ltd., York-st., Manchester. A. Brocklehurst & Co., architects, St. James-chambs., Waterfoot:—*Sedgwick & Harrison, Holmefield, Rawtenstall.

Rochdale.—Structural alterations to fire station in Maclure-rd., for T.C. S. H. Morgan, B.S.:—*Ashton Smethurst (Builders), Ltd., Suffield-st., Middleton, Manchester.

Rowley Regis.—Alterations to Beeches-rd. council schools, Blackheath, for E.C.:—*W. T. Harmon, Stourbridge, £10,900.

Rowley Regis.—Painting (a) senior boys' school (interior), (b) Macefields senior boys' school (interior) and Doulton-rd. junior mixed school (interior), (c) Doulton-rd. junior mixed school (exterior), for E.C.:—(a)*C. Green & Porter, Stourbridge, £458; (b)*Hyde Bros., Old Hill, near Dudley, £565; (c)*J. Hackett, Rowley Regis, £83 5s. 10d.

Rowley Regis.—Caretaker's house to Rowley Hall council school, Throne-rd. estate, for E.C. L. J. Taylor, B.S. Quantities by B.S.:—*Wm. Cooper & Son, Ltd., West-st., Blackheath, nr. Birmingham, £699.

Rowley Regis.—Electric lighting installations in 114 houses on Bell End and Station-rd. housing estates, for T.C. L. J. Taylor, B.S.:—*E. A. Chapman & Co., Reddal Hill-rd., Old Hill, £448.

Rugby. — Alterations and additions to school, Barby-rd., for Governors of Rugby School. W. T. Lovedale, architect, 2, Lawrence Sherriff-st.:—*Foster & Dicksee, James-st., Rugby, £10,000.

Rushden.—Bungalow building to accommodate 20 beds at Rushden House Sanatorium, for Northamptonshire C.C. G. H. Lewin, F.R.I.B.A., County Architect, Northampton:—*Childs & Co., Wellingborough-rd., Finedon, Northants.

St. Neots.—Six houses at Offord D'Arcy and four houses at Tilbrook, for R.D.C.:—

	Tidbrook.	Offord.
T. Smith & Son, Great Staughton	£2,150 10	—
*E. Brittain, Eaton Ford	1,620 0	£2,425
F. Covington	1,950 0	—
C. Smith & Son, Eaton Socon	—	2,572
Loakes & Pettit	1,756 0	2,874
Reed & Peck	1,718 17	2,635

Sale (Ches.).—Extensions to central depot at Bridgewater-st., for T.C. E. Bleakley, B.S.:—*B. Smith, 60, Chapman-st., Hulme, Manchester.

Scarborough.—Senior school, Scalby, for North Riding E.C. J. R. White, F.R.I.B.A., County Architect, Northallerton:—*F. W. Plaxton, Castle Works, Scarborough, £23,822.

Scunthorpe.—53 blocks of maisonettes, Warwick-rd., for Melville & Webber, 40, Pall Mall, London, S.W.1. W. N. Cook, architect:—*Super Homes (Wolverhampton), Ltd., 7, St. Mary's-st., Bridgnorth. (Estimated cost £58,000.)

Sheffield.—Extensions to Cathedral, comprising erection of nave facing Church-st., for Chapter and Church Council of Cathedral. Sir Charles Nicholson & T. J. Rushton, FF.R.I.B.A., architects, 2, New-sq., Lincoln's Inn, W.C.2. W. S. Playle, quantity surveyor, Town Hall-chambs., 7, Fargate:—*G. Longden & Son, Ltd., Parkwood-works, Sheffield. (Estimated cost £50,000.)

Sheffield.—Duplication of Derwent Aqueduct, for Derwent Water Board, Bamford. Joint engineers, W. Keay, 6, Millstone-st., Leicester, and Mott, Hay & Anderson, Iddlesleigh House, Caxton-st., Westminster, London, W.1:—*Lehane, Mackenzie & Shard, Ltd., 37, Irongate, Derby. (Estimated cost £84,000.)

Sheffield.—Methodist Church and Sunday-school at Maltravers-rd., for Sheffield Methodist Church, Victoria Hall, Norfolk-st. G. R. Bower, architect, 13, St. James-rd. :—*Gillam & Sons, Highland-rd., Sheffield, £3,500.

Southampton.—Reconstruction of Northam Bridge, for T.C. :—*Holloway Bros. (London), Ltd., 157, Millbank, S.W.1, £146,250.

Southgate.—Reconstruction of Green-lanes between Palmers Green Triangle and Barrowell Green, for T.C. :—*Percy Bilton (Roadways), Ltd., £33,835 8s. 10d.

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Staffordshire.—Works, for C.C. :—Erection of Aldridge (Pheasey Estate) junior council school :—‡W. Kendrick & Sons, Ltd., Walsall, £16,225; erection of Westwood-rd. junior council school—‡W. Higley & Son, Shrewsbury, £9,993.

Stamford.—Alterations and additions, Stamford Cattle Market, for T.C. B.E. :—*Ireson & Sons, Stamford.

Stepney.—31 dwellings on West India House site, for B.C. :—

H. C. Janes, Ltd., S.W.1	£25,364 19 11
Turnbull & Son, E.C.3	23,998 0 0
R. J. Rowley, Ltd., N.17	22,863 0 0
Raglan Building Co., Ltd., Wembley	22,715 0 0
‡W. H. Gaze & Sons, Ltd., 19-23, High-st., Kingston	22,363 0 0
A. E. Symes, Ltd., E.15	21,997 0 0
Hansard, Ltd., W.1	21,756 0 0
George Barker, E.1	21,287 0 0

(B.E. and S.'s estimate: £23,000.)

Stourport. — Interior decoration of 80 council houses at Olive-gr., Martley-rd., Dunley-rd., Minster-rd., Warwick-st. and Prospect-rd., for U.D.C. L. H. Poole, S. :—*A. Stokes, £153.

Stroud.—Warehouses and offices, for H. J. Heinz Co., Ltd. W. E. R. Randall, architect, 23, Railway-st., Chatham W. W. Dearle & Henderson, quantity surveyors, 13, John-st., W.C.2. :—*E. H. Burgess, Ltd., 34, Grosvenor-rd., S.W.1.

Sunderland. — Rebuilding the "Blandford Inn." W. & T. R. Milburn, architects, 17, Fawcett-st. :—*R. W. Bell, Brantham-rd., Newcastle, £6,000.

Sunderland.—Sports pavilion at Hylton-rd. sports field, for E.C. O. H. Mark, Education Architect, 4, Tatham-st. :—*Direct labour, £550.

Sunderland. — Alterations to "Westbury Arms" Hotel, Westbury-st., for J. Jeffrey & Co. W. & T. R. Milburn, architects, 17, Fawcett-st., Sunderland :—*Binns, Ltd., Sunderland.

Sutton Bridge.—Reconstruction and alterations to branch stores premises at Bridge-rd., for King's Lynn & District Co-operative Society, Ltd., Norfolk-st., King's Lynn. Ellis Middleton, L.R.I.B.A., architect, 3, Tuesday-st., Market-pl., King's Lynn :—*J. Medwall & Sons, Railway-rd., King's Lynn.

Thornaby-on-Tees.—Extensions to town hall, for T.C. P. Brown, B.E. :—*Direct labour.

Wellington.—Houses, for R.D.C. :—(a) 4 at Church-ln., Fitzhead; (b) 8 at Nynehead; and (c) 8 at Budgetts Cross, West Buckland :—(a) *W. White & Sons, £1,710 5s.; (b) *F. W. Gibbs & Son, £3,422 13s; (c) *W. White & Sons, £3,070 7s. 6d. (Subject to M.H. approval.)

Westminster.—Works, for City Council: —
Provision of new timber and oil store, etc., Grosvenor canal depot :—

Demolition & Construction Co., Ltd.	£433 0 0
Love & Co. (Builders), Ltd.	432 18 6
John Garlick (1910), Ltd.	431 0 0
Townsends (Builders), Ltd.	420 0 0
Macleod & Zinovieff	413 15 0
Walter Lilly & Co., Ltd.	384 0 0
‡Dix (Builders), Ltd.	345 0 0

Repairs and decorations to Admiral House :—‡Hutchings & Keasley, Ltd., £165 2s.
Repairs and decorations, Walden House, Pimlico-rd. :—‡Sims & Russell, £297 16s. 10d.

Whiston.—Adaptation of 3 rooms in council offices as report centre. Watson Garbutt, E. and S. :—*Knight & Lord, 2a, Windsor-rd., Liverpool, 13, £263 14s.

Whitby.—Sub-station building at back of St. Hilda's-terr., for U.D.C. :—*John Kidd & Son, 17, Baxtergate, Whitby, £210 15s.

York.—Transformer sub-station, York-rd., Acomb, for E.C. C. J. Minter, City E. and S. :—*T Belt & Sons, Ltd., 5, Swingate, York, £837.

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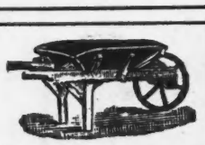

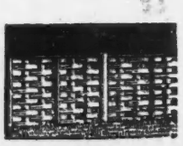

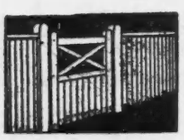

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STRUCTURAL PRECAUTIONS

against

AIR ATTACK

Theory & Practice

By Oscar A. Bayne, A.R.I.B.A.

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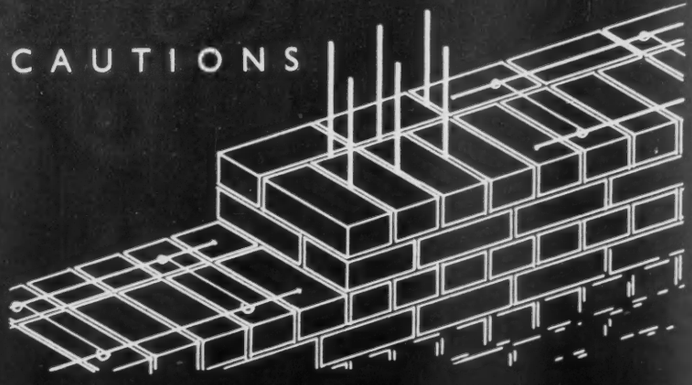

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STRUCTURAL PRECAUTIONS

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AIR ATTACK

Theory & Practice

By Oscar A. Bayne, A.R.I.B.A.

THE SCOPE OF THE SUBJECT AND OBJECTIVES

THE SCOPE OF THE SUBJECT.—1. It is extremely difficult in making any study of Air Raid Precautions work to define satisfactorily the limits to be observed and the scope of the work under consideration.

THE OBJECTIVES—2. Exactly what the objects of air raid precautions are is as yet not clearly defined. Structural precautions will be of one kind if they are intended only to make the building less easily damaged, but they will be of an entirely different kind if they are intended to protect the occupants of that building.

3. This question of occupancy at once raises a host of others—population—evacuation—shelters—bomb-proof refuges—and the very difficult question of the degree of protection to be given to personnel.

4. It would seem that buildings in any reasonably-sized community are likely to be directly attacked, and that densely populated areas will probably be preferred even if only because each bomb should be more destructive to both life and property.

PRECAUTIONS AND PROTECTION—5. It follows then ideally that whatever structural precautions should be taken in buildings should be taken in all buildings except perhaps in very small villages and in the country. Correspondingly, whatever measures are to be adopted, for the protection of the population, they should be taken everywhere with the possible exceptions given above.

SECTION I.
EVACUATION AND ITS EFFECT ON BUILDING

A Temporary Measure?—6. The question of density is of great importance, and it may perhaps be of value to consider it very broadly as well as from the point of view of immediate necessity. The immediate programme is one of evacuation to any available place, a device designed to reduce the death rate and the likelihood of panic. It does nothing to reduce the destruction of property, it leaves large numbers still in relatively congested areas, it is in conception a temporary measure, yet of necessity it must become semi-permanent.

The Official Report.—7. The Official Report on evacuation is based upon evacuating one-third of the population from certain undefined areas broadly indicated by the map reproduced in the Report. These areas appear to be mainly around the congested industrial centres.

8. Paragraph 57 of the Report states: "We have reached the conclusion, on our examination of the information supplied by the Ministry of Health and the Department of Health for Scotland, that the problem of accommodation provides the limiting factor to the scale on which facilities for evacuation can be provided."

New Accommodation.—9. It remains then to consider what should be done for those who cannot be accommodated in existing buildings. Broadly, the alternatives are:

(a) to provide full protection;
(b) to evacuate and build new temporary or permanent accommodation to receive the evacuated population which cannot be accommodated in existing building;
(c) a compromise consisting of partial schemes of (a) and (b).

Evacuation and New Accommodation.—10. Possible forms which new accommodation could take might include canvas camps (which are not recommended in the Official Report); temporary hut camps; lightly constructed permanent building in the form of holiday camps; and permanent rehousing which would amount in practice to a modified form of decentralisation and would entail the establishment of all normal civic services and civil organisations.

Holiday Camps.—11. In the long view decentralisation is the obvious solution; for more immediate purposes the holiday camp appears to be by far the most satisfactory; it would provide for war emergencies and could be used to confer immense social benefits on a section of the population which badly needs them. Such centres could be used all the year round in peace time for holiday purposes and could provide invaluable accommodation when a war emergency arises.

Site Conditions.—12. The site conditions desirable in a war emergency camp of this kind are much the same as those required for a holiday camp either for those benefiting under the holidays-with-pay movement or for school-children: both require to be in the country, preferably amongst trees, and in groups of small buildings rather than in a few large ones.

13. The amount of such accommodation which would be required cannot even be guessed at until some basis of areas and categories of people has been determined. If, however, 300 such camps were established each capable of accommodating about 3,500 persons, the total accommodation would be over a million.

Standardisation in Building.—14. Obviously such a programme would have to be carried out as economically as possible and some form of standardised planning and construction would be called for. The planning might take the form of a standardised unit bedroom for two persons with lighting and heating services and a lavatory basin; baths, lavatories and laundries being provided in standardised blocks and the dining and social rooms being common to the whole camp. Except in the north it might be possible to dispense with internal corridors by using open or semi-enclosed ways.

New Building Methods.—15. The construction would call for a complete departure from our accepted building methods; it would not necessarily demand wholesale standardisation and pre-fabrication, but in a building programme of this size and scope, standardisation and completion-within-the-factory would go

far to reduce costs and increase speed of construction, particularly if applied to fittings and equipment and perhaps to parts of the structure itself.

16. It would be a great stride forward in building technique if "wet-work" could be eliminated, but since no satisfactory system for camps appears to have been evolved as yet other than timber construction, it would appear that the basis of the structure will remain brick.

A Possible Method. — 17. A light shell of brickwork, probably reinforced, with a lining of partition block not requiring plaster seems to be a form of semi-standardised construction which has great possibilities. Whether shelters or refuges would be required in such camps in spite of their location is difficult to determine. In some cases they might be desirable, but in most they could probably be omitted, although it must always be borne in mind that any settlement, however small, is liable to attack if once the principle of attacking the civil population be adopted.

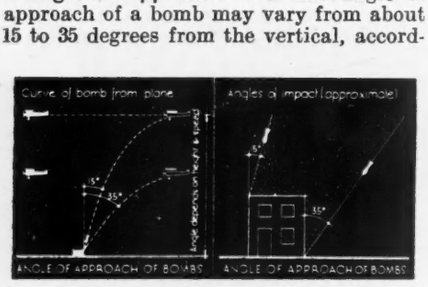
SECTION II.
FORMS OF ATTACK, WEAPONS AND GENERAL EFFECTS

18. Broadly speaking there are five methods of aerial attack:—

(*a*) Low and medium height bombing.
(*b*) High bombing.
(*c*) Dive bombing.
(*d*) Machine-gunning.
(*e*) Gas spraying.

Machine-gunning and gas-spraying have no bearing upon the subject of structural precautions, and the differences between the three types of bombing can be ignored so far as structural precautions are concerned, except to record two points; that dive bombing is probably the more accurate of the three and gives the bombs a greater power of penetration, and that it may also give a different angle of approach to the bomb.

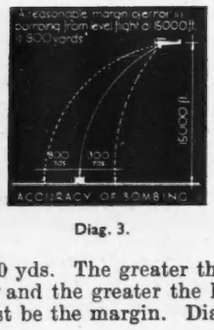
Angle of Approach. — 19. The angle of approach of a bomb may vary from about 15 to 35 degrees from the vertical, according to the speed and height of the aeroplane, the size, shape and weight of the bomb and the atmospheric conditions. Diags. 1 and 2.



Diag. 1. Diag. 2.

Velocity.—20. The velocity of a bomb at impact again depends upon the six conditions mentioned above. Theoretically, and neglecting air resistance, any bomb dropped from a height of 20,000 ft. would strike the earth at a velocity of 1,130 ft. per second. Allowing for air resistance and other factors the terminal velocity is approximately 400-500 ft. per second for small incendiary bombs, and about 800-900 for high-explosive bombs.

Accuracy of Bombing.—21. It has been stated that in bombing from level flight at 15,000 ft. a "reasonable" margin of error is 800 yds. The greater the speed of the 'plane and the greater the height, the larger must be the margin. Diag. 3.


A reasonable margin of error in running from level flight at 15000 ft is 800 yards
15000 ft
800 yds
100 yds
ACCURACY OF BOMBING

Diag. 3.

High-explosive Bombs.—22. The various types and sizes of high-explosive bombs have been dealt with in numerous publications, and it is sufficient here to summarise them, since the details do not concern us much so far as precautions are concerned.

23. High-explosive bombs may vary in size from 25 lb. to 3,000 lb. or more, those more likely to be used being between 500 and 1,000 lb. They may be two types:—

(*a*) Delayed action bombs which may be armour-piercing; semi-armour-piercing; and demolition or general purpose bombs.

(*b*) Percussion bombs, also called fragmentation bombs, which explode on impact.

24. Armour-piercing bombs are used mainly in naval work and against fortifications. Semi-armour piercing bombs are designed for high-power penetration, and are intended for use in destroying fortifications, protected accommodation and buildings which are known to be well constructed.

Demolition or general purpose bombs have delayed action and are intended, as the name implies, for all normal bombing work. The effects of high-explosive bombs are considered in a later section of these notes.

Gas Bombs.—25. The gases which may be used in bombs are dealt with in full in Air Raid Precautions Handbook No. 1, issued by the Home Office.

Weight.—26. Gas bombs may vary in size and weight up to 500 lb. or more, and may be charged with a small amount of explosive to ensure distribution of the gas, particularly if in liquid form.

Penetration.—27. Their powers of penetration are the result of their weight and velocity, and although they are considerable, they are not to be compared with the penetrative powers of high-explosive bombs.

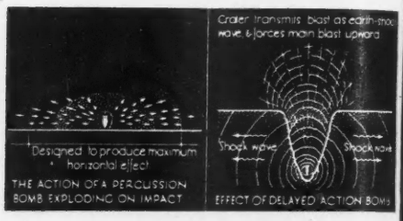
Gas Protection.—28. Gas protection is divided between the personal protection of each individual and the provision of gas-proof shelters; there is, however, a large field for protective work in providing safe accommodation for foodstuffs, etc., which are readily contaminated.

Incendiary Bombs.—29. A great variety of materials are in use as incendiary media in bombs. The bombs vary in weight from 1 kilo (2¼ lb.) to 27 kilos (60 lb.). It is generally stated that the 2¼ lb. and 4½ lb. incendiary bombs are the ones most likely to be used. There is, however, some doubt of their value in view of their relative ineffectiveness when used in considerable numbers over Madrid and Barcelona. It may be that incendiary bombs will be little used, or that much heavier types will be developed, but it would be unwise to base our precautions on the belief (or hope) that only the smaller types will be used. The only virtue in the small types, from the attacker's point of view is that a great number can be carried in each 'plane. It would be dangerous to assume that this virtue would keep them in use if they had been proved to be ineffective.

30. There is another type of incendiary bomb, if bomb it can be called, which is believed to have been already manufactured in enormous quantities. This type is a small, light cylinder intended for use in great numbers to cause innumerable small fires.

THE EFFECTS OF HIGH-EXPLOSIVE BOMBS.

Percussion Type.—31. The effects of delayed action and impact bombs are in the main much the same, although there are certain vital differences. The percussion type bomb which explodes on impact is usually designed to give a maximum horizontal blast, and a high degree of fragmentation (Diag. 4).


Designed to produce maximum horizontal effect
THE ACTION OF A PERCUSSION BOMB EXPLODING ON IMPACT
Crater transmits blast as earth-shock wave, & forces main blast upward
Shock waves
Shock wave
EFFECT OF DELAYED ACTION BOMB

Diag. 4. Diag. 5.

Delayed Action. — 32. The delayed action bombs are, on the other hand, designed to bury themselves deeply into the object before exploding and are intended for what might be called disruption from within (Diag. 5).

General Purpose.—33. While probably that the general purpose bomb (delayed action) will be fairly consistently used in attacking unfortified buildings, there is always the possibility that bombs of greater penetrative power will be used. This being so they must be taken into account in designing structural precautions; the effects of both types may therefore be considered together.

34. The destructive capacity of any bomb or even type of bomb cannot be defined in any exact terms owing to the lack of data and to the influence of the "site conditions" and the construction of the buildings concerned. Some general picture can, however, be obtained from the following notes, figures and accounts of observed results.

High Explosives. — 35. The explosion of a bomb is described by J. B. S. Haldane (Ref. 2) in the following words:—

PRESSURE WAVE.—"An explosive is a solid which can be changed very suddenly into hot gas. . . . Thus a cubic inch of trinitrotoluene is turned into about two or three cubic feet of hot gas when it explodes. . . . The hot gases from a bomb not only burst its case, but push away everything in the neighbourhood, with an almost inconceivable force. The air in front of them is pushed forward at a speed of about 4,000 miles an hour. . . ."

NEGATIVE PRESSURE WAVE.—"The pressure wave, which only persists at any point for about one thousandth of a second, is succeeded by a pulse of negative pressure or suction which appears to last a little longer. This is analogous to the hollow behind a big wave in water."

Craters. — 36. Bombs exploding in streets or on open ground produce a crater which, of course, varies in size with the

type and weight of bomb and the material on which it falls. Very little information on the subject of bomb craters is at present publicly available, particularly in regard to craters in road surfaces, but the following table published by Swiss authorities (3) in 1936 gives figures for demolition bombs falling on various other materials.

THEORETICAL DEPTHS AND DIAMETERS OF CRATERS FOR DEMOLITION BOMBS.

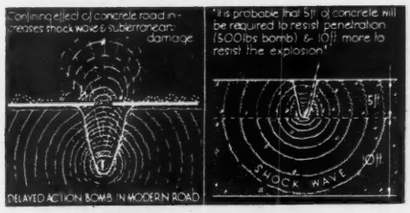
THEORETICAL DEPTHS AND DIAMETERS OF CRATERS FOR DEMOLITION BOMBS.

Weight of Bomb.	Soft Rock.		Ballast, Compact Gravel.		Sandy Earth.		Soft Sand, Dry Earth, Clayey Earth.	
	Depth.	Diam.	Depth.	Diam.	Depth.	Diam.	Depth.	Diam.
	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
1 cwt. (50 kilo) ...	4 7	14 9	5 7	16 5	8 6	18 1	11 6	19 8
2 cwt. (100 kilo) ...	4 11	19 8	6 3	21 4	9 2	23 1	12 6	26 3
6 cwt. (300 kilo) ...	7 7	27 11	9 6	31 2	14 1	34 5	19 8	39 4

These figures appear to be small in comparison with other observations.

37. Haldane (2) writes: "The largest bomb crater in Barcelona, probably from a half-ton bomb, is said to be 22 ft. deep and 60-70 ft. across. However, this is quite exceptional. A crater over 30 ft. across is unusual."

Modern Roads.—38. What the effect of a delayed action bomb exploding in a modern English road would be is difficult to forecast. The area of the crater might be smaller owing to the resistance of the heavy reinforced concrete slab, but the depth might be considerably greater and the breaking up of the road might extend far beyond the crater itself because a delayed action bomb would probably penetrate to the earth below the road slab before exploding. The resistance offered


Confining effect of concrete road increases shock wave & subterranean damage
DELAYED ACTION BOMB IN MODERN ROAD
"It is probable that 5ft of concrete will be required to resist penetration (500lbs bomb) & 10ft more to resist the explosion"
5ft
10ft
SHOCK WAVE

Diag. 6. Diag. 7.

by the road slab would then tend to increase the downward and sideward force of the explosion (Diag. 6).

39. Percussion type bombs which explode on impact do not form a large crater unless they fall in relatively soft ground and penetrate into it.

Penetration Through Materials.—40. The capacity of delayed action bombs to penetrate solid materials is so high that it can be disregarded as far as normal buildings are concerned because it would be economically impossible, if not impracticable, to construct any effective barrier. Penetrative power is, however, a vital factor in fortifications and in refuges where effective protection must be given.

41. The Swiss authorities quoted above (3) give the following figures for the penetration of bombs into various materials and for effective protection.

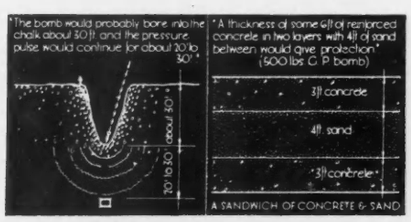
PROTECTION AGAINST PERFORATION AND EXPLOSION.

PROTECTION AGAINST PERFORATION AND EXPLOSION.

Weight of Bomb.	Concrete, 5,690 lb. at 28 days specially reinforced.	Limestone rock or reinforced concrete (3,130 lb. grade).	Concrete not reinforced 2,150 lb. per sq. in. at 28 days.	Constructions in Tunnel.		
				Soft Rock.	Compressed Gravel.	Earthy Sand.
	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
1 cwt. (50 kilo) ...	2 4	4 3	4 7	11 6	18 1	21 4
2 cwt. (100 kilo) ...	3 7	5 7	6 11	16 5	24 7	29 7
6 cwt. (300 kilo) ...	4 7	6 11	9 2	24 7	36 1	42 8

Resistance of Concrete.—42. T. E. Scott (5), speaking at the R.I.B.A., said: "It is considered by competent authorities that 5 ft. of reinforced concrete may be required to resist the penetration of certain types of 500-lb. bombs and a further 10 ft. may be necessary to afford complete protection against the resultant explosion" (Diag. 7).

Resistance of Earth.—43. Various figures which have been recommended for effective earth cover over refuges give some guide to the penetrations to be expected. Since some allowance must have been made for the shock area round the


"The bomb would probably bore into the chalk about 30ft and the pressure pulse would continue for about 20 to 30ft"
about 30ft
20 to 30ft
"A thickness of some 6ft of reinforced concrete in two layers with 4ft of sand between would give protection" (500 lbs C.P. bomb)
3ft concrete
4ft sand
3ft concrete
A SANDWICH OF CONCRETE & SAND

Diag. 8. Diag. 9.

point of explosion these figures should not be regarded as of actual penetration.

French authorities (6) recommend:—

Twenty-six feet of earth cover for 2-cwt. bombs in "normal earth."

Thirty-nine feet of earth cover for 6-cwt. bombs in "normal earth."

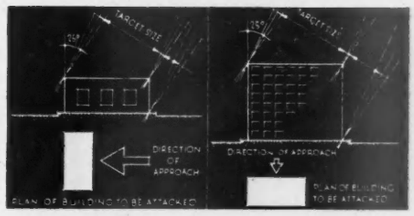
Sixty-five feet of earth cover for 20-cwt. bombs in "normal earth."

44. The A.A.S.T.A. based the estimates given in its report (7) on an earth cover of 50 ft. in London clay (Diag. 8).

E. L. Bird, in a paper at the Architectural Association, said: "Complete protection is feasible . . . with a thickness of 60 ft. of earth above."

Resistance of Concrete Plus Earth.—45. Col. W. Garforth, Technical Adviser to the Home Office, said (9): ". . . . to obtain 100 per cent. protection against a 500-lb. semi-armour-piercing bomb, some 60 ft. to 70 ft. of earth, or 12 ft. to 15 ft. of reinforced concrete, or some proportionate combination of the two, is required above the space to be protected . . . in the case of a 500-lb. general purpose bomb with a light case, a thickness of some 6 ft. of reinforced concrete in two layers of 3 ft. each, with 4 ft. of sand in between, is required to give 100 per cent. protection." In answer to a question, Colonel Garforth said that 50 ft. to 60 ft. of chalk in the Epsom Downs would be sufficient to give protection (no size of bomb was specified). A bomb would penetrate the chalk for about 30 ft. and the pressure pulse would continue for about 20 to 30 ft. (Diag. 9).

Penetration Through Construction.—46. Since the angle of approach of bombs may be expected to be between 15 deg. and 35 deg. from the vertical, the external walls of buildings may be hit as well as the roof. A single-storey building, say, 60 ft. by 30 ft. by 12 ft. high has an area on plan (roof area) of 1,800 sq. ft., or a target area from the average angle of 25 deg. from the vertical of about 1,600 sq. ft., when approached along its short



Diag. 10. Diag. 11.

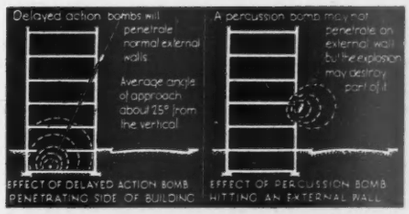
axis. The exposed wall area is 720 sq. ft., giving a target area of about 300 sq. ft. when approached from the same direction (Diag. 10).

47. The proportions are, of course, very different in the case of tall multi-storey buildings. Taking a small city block bounded by four streets, the buildings upon it may be taken for these purposes as one.

48. If the block is, say, 250 ft. by 100 ft. and the buildings 80 ft. high, the comparable figures are: Plan area (roof area), 25,000 sq. ft.; target area of roof, 22,700 sq. ft.; exposed wall area on long side, 20,000 sq. ft.; target area of this wall, 3,500 sq. ft.

It will be seen then that penetration (and protection, if any) must be considered not only in relation to the roof construction but also the external walls (Diag. 11).

49. It would be poor protection which strengthened the roof but left the walls relatively light and penetrable. The point becomes a most important one when considering the design of shelters in the basements of multi-storey buildings, because unless the vulnerability of the walls is


Delayed action bombs will penetrate normal external walls
Average angle of approach about 25° from the vertical
EFFECT OF DELAYED ACTION BOMB PENETRATING SIDE OF BUILDING
A percussion bomb may not penetrate an external wall but the explosion may destroy part of it
EFFECT OF PERCUSSION BOMB HITTING AN EXTERNAL WALL

Diag. 12. Diag. 13.

appreciated, unwarranted emphasis may be placed upon the protective value of the floor construction above (Diag. 12).

50. Percussion type bombs which explode on impact may be expected to explode immediately upon touching material offering any appreciable resistance at all; it is conceivable that a very light roof of thin sheet material would not offer sufficient resistance to explode the bomb, which would go through it and explode on reaching some more solid material (Diag. 13).

51. As a rule it can be taken that such bombs will have no very great penetrative power due to velocity only, but that their destructive power will be limited to the effective field of the explosion. For instance, such a bomb hitting a solid flat roof, even of timber construction, may not penetrate it, but the subsequent explosion may completely destroy that floor and the adjoining construction.

52. Similarly, if it hits an external wall a percussion type bomb might not penetrate it before exploding, but the explosion following would probably demolish the wall for a considerable area.

53. Delayed action bombs are, however, very different, not only because the delayed action allows time for the bomb to penetrate the construction with the force of the impact, but also because such bombs are specially designed in weight, shape and material to increase their penetrative power. Since, as has already been mentioned, it is believed that a 500-lb. delayed action bomb will probably penetrate 5 ft. of concrete and will require a further 10 ft. of concrete to resist the explosion following, it follows that external walls and roofs cannot possibly be built in normal work to afford effective protection. It remains then to consider the accumulated protective effect of the floor construction in normal multi-storey buildings. Again, exact figures are not obtainable and accounts of observed cases vary widely.

54. Bird (1) says: "The semi-armour-piercing bomb can be counted on to go right through a London Building Act 80-ft. building from top to bottom."

55. Skinner, writing of experience in Spain, says: "The delayed action type, if they fall on a house, invariably explode at about the third floor down."

56. A report issued by the Institution of Structural Engineers (8) describes two examples from China. In one case a bomb, believed to be 500 lbs., hit the roof of a reinforced concrete frame building erected in 1917. It passed through the 3-in. concrete roof slab and three floor slabs each 4 in.-5 in. thick. It came to rest upon the ground-floor paving. In another case a bomb, believed to be 750 lbs., hit the roof of a warehouse; it passed through the 4-in. reinforced roof slab, three 6-in. concrete floor slabs and 8 ft. of rice stacked in bags. The bomb broke up during its passage through the building, but it failed to explode.

BLAST, FRAGMENTATION AND SHOCK.

Percussion Bombs.—57. The percussion type bomb, since it explodes on impact and does not bury itself in the material hit, is free to explode horizontally and vertically. It is usually designed to have a maximum horizontal blast, and its case is designed to break up into numerous jagged fragments, which will be thrown

Diag. 14.

Diag. 15.

with terrific force in all directions. The effects can be separated broadly into blast effects and effects of fragmentation (Diag. 14).

Delayed Action. — 58. Delayed action bombs either bury themselves in the ground or penetrate to the interior of a building. They are not designed for maximum fragmentation, but for maximum blast effect consistent with their penetration powers.

Blast and Shock. — 59. A bomb which has buried itself in the ground will have its horizontal blast restricted by the earth; its upward and outward blast may therefore tend to be increased, and the material thrown up will form dangerous and destructive missiles. The horizontal blast will be felt as earth shock or tamping, which is a vital factor in the design of underground shelters, and which is very destructive to water and gas mains and other underground services (Diag. 15).

Fragmentation. — 60. Flying fragments or splinters from the case of an exploded bomb, together with other debris thrown out in the form of missiles by the force of the explosion, serve to increase enormously the effective field of a bomb.

61. Bomb-case fragments ". . . . can cause death to people as far as 400 yards away" (7), and are said to be capable of travelling "about 1,000 yards" (9). Presumably this means the bomb would, in open ground, have an effective area of 2,000 yards diameter.

62. This figure is higher than any of the following figures given by Major W. C. Sherman, of the U.S. Army (10).

Bomb.	Diameter of Danger Zone.
100 lb.	200 ft.
300 lb.	300 ft.
600 lb.	400 ft.
1,100 lb.	600 ft.
2,000 lb.	1,200 ft.
4,000 lb.	2,400 ft.

63. Obviously fragments and flying missiles from a high-explosive bomb are extremely dangerous to life over a very wide area if the explosion takes place in an open space or street. Their powers of penetration are high, but not so high that some protection cannot be given in normal buildings. Perhaps it is for this reason that specific figures on this small part of the subject have been issued officially.

A Standard of Protection.—64. For the purpose an arbitrary standard has been adopted—and it is recommended that wherever possible protection should be given capable of withstanding (preventing the penetration of) splinters from a 500-lb. bomb bursting 50 ft. away, not in a confined space.

65. The following figures are given in A.R.P. Handbook No. 6, Air Raid Precautions in Factories and Business Premises (11), for materials giving this degree of protection.

THICKNESS OF MATERIALS.

Materials.	*Thickness.*	*Remarks.*
Mild steel plate	1½ in.	Special steels may give increased resistance.
Stock bricks in cement mortar.	13½ in. solid. 15½ in. hollow	2-in. cavity.
Unreinforced concrete (not weaker than 1-6 mixture).	1 ft. 3 in.	
Reinforced concrete.	12 in.	Normal structural reinforcement.
Reinforced concrete.	10 in.	Specially reinforced to resist the punching shear effect of the splinters which induces tensile stresses between the front and rear faces of the concrete wall. Rectangular links (connecting front and back reinforcement) of ½-in. diameter rods at 12 in. centres, is a suggested arrangement which has been tested successfully.
Sand or earth or coal dust revetments.	2 ft. 6 in.	This should be the minimum thickness, for example, at the top of a traverse or revetment.
Coal (in lumps)	2 ft. 6 in.	
Shingle (or ballast) revetments, contained between wood or C.G.I. sheeting.	2 ft.	A sandwich of shingle between sheeting.
Shingle revetments contained between steel plates. Front steel plate ¼ in. thick, back plate ½ in. thick.	10 in.	

The figures are described as being of a provisional character "based on the information at present available."

Reinforced Brick and Concrete. — 66. These recommendations appear to deal adequately with concrete walls in that they have been considered unreinforced, with normal reinforcement and with special reinforcement. Apparently little data were available on the subject of brickwork because no figures are given or recommendations made in regard either to the bonding or the reinforcement of brickwork.

67. It is a little difficult to determine the importance of these recommendations in building work. Walls of such thickness and protective capacity are hardly adequate for shelters, and their use in normal buildings would appear to be of limited value.

The Value of Thicker Walls. — 68. If, for example, we take a building A with 9-in. or 11-in. cavity walls, we may assume that these walls will be penetrated by fragments from about 70 ft. away but not from, say, 75 ft. away. If this building had been built with the recommended 13½-in. walls it would have been safe against penetration from fragments from about 50 ft. away. The increase in wall thickness and the increase in cost

Diag. 16.

has, therefore, affected the situation only if the bombs fall within the zone B. That is more than 50 ft. but not more than 75 ft. from the building (Diag. 16).

69. It would seem, therefore, that undue importance can be given to increased wall thickness. The subject is referred to again at greater length under the heading of Structural Precautions in Buildings.

Blast Effects. — 70. The explosive force of a bomb, sometimes referred to as a shock wave, blast, pressure wave, blast pressure, or air impulse wave, is extremely violent but of short duration, and is followed by a reaction which is at least as destructive as the original blast. The original blast occupies only a fraction of a second.

Period of Blast.—71. Bird (1) gives the period as 8/10,000 seconds for a 500-lb. bomb. C. W. Glover (12), Haldane (2) and Garforth (9) give it as 1/1,000 second.

72. The force of the blast varies with the size and type of bomb and, of course, with the distance from the point of explosion.

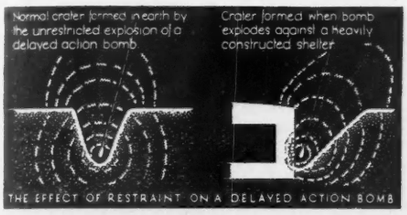
73. A Swiss formula quoted by Glover (12) gives the blast pressure P as: P=

$248Q/R^2$ lb. per sq. in. where Q is the weight of the explosive in pounds and R is the distance from the explosion in feet.

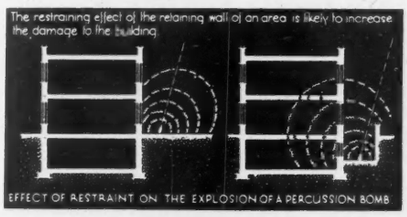
Pressure per Square Inch. — 74. The peak pressure for a 500-lb. bomb is said to be in the region of 40 lb. per sq. in. 50 ft. away from the point of the explosion.

Restraint.—75. Such figures can, however, only be approximate, since the force of the explosion in any particular direction will depend to some extent on local circumstances, and particularly upon the degree of "restraint" offered by adjoining construction and resistance and "reflective" power of the surface on which the bomb falls (Diags. 17 and 18).

76. The blast effect is greater in a vertical than in a horizontal direction with both percussion and delayed action


Normal crater formed in earth by the unrestricted explosion of a delayed action bomb
Crater formed when bomb explodes against a heavily constructed shelter
THE EFFECT OF RESTRAINT ON A DELAYED ACTION BOMB

Diag. 17.


The restraining effect of the retaining wall of an area is likely to increase the damage to the building
EFFECT OF RESTRAINT ON THE EXPLOSION OF A PERCUSSION BOMB

Diag. 18.

bombs, and to this extent they are inefficient from the point of view of destruction except in the case of a delayed action bomb exploding inside a building.

Negative Pressure Wave.—77. The reaction after the explosion is often referred to as a suction wave or pulse of negative pressure. This wave is particularly destructive to buildings, since most building construction resists inward thrusts better than outward "pulls."

Tying Construction. — 78. The tendency to collapse toward the source of the explosion calls for structural precautions which will tie the construction together to offer some resistance to the pull.

BLAST EFFECT ON BUILDINGS.

79. Having outlined broadly the forces which operate after a bomb explosion, we may turn to their actual effects on buildings, dividing the subject into three sections:—

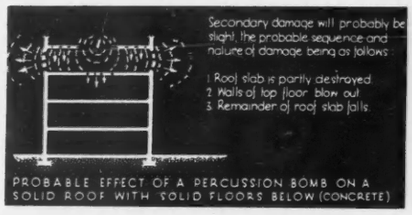
(*a*) Direct hits with percussion type bombs.
(*b*) Direct hits with delayed action bombs.
(*c*) Bomb explosions (delayed action or percussion) occurring outside a building.

DIRECT HITS WITH PERCUSSION BOMBS.

80. Percussion type bombs of the sizes used in Spain (66-110 lb.) do not, when exploding on road surfaces, cause any large crater ("perhaps 18 in. deep"). There does not, however, appear to be any information available as to the strength of roof slab required to resist the explosion.

81. Although they may not penetrate into the building before exploding it can be assumed that the force of the explosion will destroy any normal flat or pitched roof over a considerable area.

Solid Construction.—82. It is possible that the effect of bombs of this size would be limited to the top floor if the roof slab


Secondary damage will probably be slight, the probable sequence and nature of damage being as follows:
1 Roof slab is partly destroyed
2 Walls of top floor blow out
3 Remainder of roof slab falls
PROBABLE EFFECT OF A PERCUSSION BOMB ON A SOLID ROOF WITH SOLID FLOORS BELOW (CONCRETE)

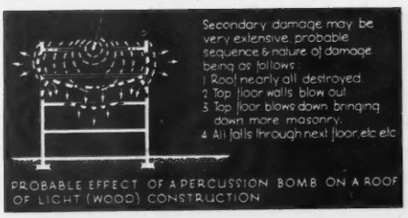
Diag. 19.

and the floor of the top storey were of heavy but normal construction. The walls of the upper floor would be blown outwards, and that part of the roof which was not already destroyed would be likely to collapse unless it was carried on a frame (Diag. 19).

Missiles and Debris.—83. In such a case the lower storeys of the building might be relatively little affected, but great damage could be done to it and to adjoining structures by falling masonry and pieces of construction and flying missiles deriving from the construction.

It is important, therefore, that all emergent construction such as chimneys, penthouses, tank-rooms, shafts, vents, parapets and other architectural features should be made as stable as possible and preferably anchored down to the main structure.

Light Construction. — 84. In a lighter type of structure, with light timber floors and roof construction, it is probable that although the explosion took place in the


Secondary damage may be very extensive, probable sequence & nature of damage being as follows:
1 Roof nearly all destroyed
2 Top floor walls blow out
3 Top floor blows down bringing down more masonry
4 All falls through next floor etc etc
PROBABLE EFFECT OF A PERCUSSION BOMB ON A ROOF OF LIGHT (WOOD) CONSTRUCTION

Diag. 20.

top storey or storeys the secondary damage caused by falling masonry and other construction would be so great that practically the whole building would be destroyed (Diag. 20).

85. It follows then that normal buildings can be designed to resist to some extent and to reduce to a large extent the effects of the percussion bomb. Unfortunately, this type of bomb is not likely to be used if destruction of buildings is the main object.

86. It may be assumed that the enemy will generally use weapons designed for the work in hand, and that, therefore, such bombs will not be used in large quantities unless the attack is upon an area composed predominantly of old, lightly constructed buildings or unless the population is not provided with effective refuges.

DIRECT HITS WITH DELAYED ACTION BOMBS.

87. Direct hits with delayed action bombs are much more destructive to buildings, partly because they penetrate further into the building before exploding and partly because they are usually much heavier than the percussion type.

Confined Explosions. — 88. Since the explosion takes place within the building its force is restricted to some extent and

The upward component is not dissipated as is the case with percussion bombs
RESTRAINING EFFECT OF WALLS ON EXPLOSION OF DELAYED ACTION BOMB

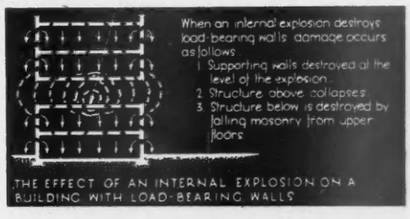
Diag. 21.

is confined; its upward component is not dissipated as is the case with percussion types (Diag. 21).

89. The penetrative capacity of such bombs has already been described sufficiently to show that no effective barrier can be incorporated in normal building work to resist penetration. The measures to be taken must, therefore, be designed to minimise the effects of the explosion when it has taken place. This at first sight appears to be a negative and inadequate approach to the subject. When, however, it is realised that one type of building is likely to be completely destroyed by a direct hit from such a bomb, while another, without abnormal construction, is likely to be so little damaged that it could be completely repaired within a week, the value of designing on this basis will be appreciated.

Framed and Other Types of Construction.—90. The two extremes can be broadly illustrated by comparing a structure built from a pack of cards with one formed like a birdcage with a covering upon it to represent the walls.

91. The pack-of-cards structure offers little resistance to internal disturbance; if any one member is displaced those above will collapse, bringing with them the remainder. The birdcage, on the other hand, will remain in skeleton form after a great deal of internal disturbance; if an explosion takes place the covering may be blown off but the cage itself will


When an internal explosion destroys load-bearing walls damage occurs as follows:
1. Supporting walls destroyed at the level of the explosion
2. Structure above collapses
3. Structure below is destroyed by falling masonry from upper floors
THE EFFECT OF AN INTERNAL EXPLOSION ON A BUILDING WITH LOAD-BEARING WALLS

Diag. 22.

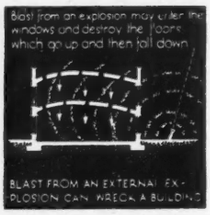
remain. Even if some members of the cage framing are destroyed the remainder stays in position and does not collapse (Diag. 22).

Load-bearing Walls. — 92. Thus it has been found in Spain that solid load-bearing walls of brick or masonry offer high resistance to blast and splinters, but if they are destroyed in whole or in part the secondary damage caused by the collapse of the floors and walls above is enormous; not only do floors and beams which are left unsupported fall, but bring down with them the walls and partitions into which they are built. In this way whole buildings are liable to collapse because one or more walls have been partially blown away.

Light Floor Construction.—93. In a building of this kind with solid load-bearing walls and wood floors, it is possible when a delayed action bomb falls in the interior that the floors, if of light wood construction, would yield readily, thus re-

lieving the force of the explosion on the external walls. In that case the interior of the building would be blown up and down while the shell might remain standing. Such an effect was caused in one case described by Haldane, although the cause was different.

94. " . . . a large bomb burst near a hospital at Tarancon in Spain about Christmas, 1937. The walls did not fall, but the blast entered the windows and

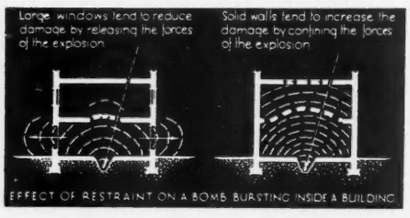

Blast from an explosion may enter the windows and destroy the floors which go up and then fall down
BLAST FROM AN EXTERNAL EXPLOSION CAN WRECK A BUILDING

Diag. 23.

lifted the floors up. They fell down again, crushing fourteen wounded men to death, and leaving the building a mere shell " (Diag. 23).

95. From this description one would assume that the building was of modern type with large window areas and relatively small wall surfaces.

Solid Floors. — 96. In a similar building with load-bearing walls but solid concrete floors, the effect of an explosion in


Large windows tend to reduce damage by releasing the forces of the explosion
Solid walls tend to increase the damage by confining the forces of the explosion
EFFECT OF RESTRAINT ON A BOMB BURSTING INSIDE A BUILDING

Diag. 24.

the interior would probably be rather different in that the floors above and below the point of explosion would offer more resistance and the blast on the external walls would therefore be greater. If there was an exceptional amount of window area it is possible that it would relieve the blast pressure on the walls and floors to some extent, but with normal penetration either the walls or the floors or both would be destroyed (Diag. 24).

97. It can be taken for granted that when such an explosion occurs inside a building " something has to go," and to some extent the thing which goes first will relieve the pressure on the remainder.

English and Spanish Construction.—98. Spanish examples must not be taken as directly applicable to English conditions owing to the differences which may exist in methods of construction and types of bomb used. A word of warning is yet perhaps permissible: it is frequently said nowadays that Spanish conditions are little if any guide to probabilities in England because Spanish building methods were so poor. There is, of course, some truth in it, but this grain of truth should not be allowed to blind us to the fact that much old and new building in England is also extremely poor, that not only is it badly constructed, but it is as lightly constructed as possible, and again there are whole districts in our towns where practically all the buildings have already had a full life and more, and now will hardly withstand traffic vibration, much less aerial attack.

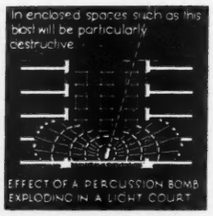
99. " The L.C.C. official records, published in 1920 . . . show that the 1,000-kilo bomb dropped . . . on Nos. 61-67, Warrington-crescent, Maida-hill, N.W., totally demolished four houses, seriously damaged 119 additional houses within a radius of 600 ft." (12).

Precaution Against Internal Explosions. — 100. The conclusion to be drawn then is that a form of construction which will act more or less as a safety valve without causing the whole building to collapse in consequence will serve best to reduce the effects of a direct hit from a delayed action bomb.

Value of Precaution.—101. Obviously any precautions which effectively reduced the consequential damage would be immensely valuable both to the property owner and to the civil authorities upon whom will fall in time of war the duty of maintaining civil organisation.

EXPLOSIONS OUTSIDE BUILDINGS.

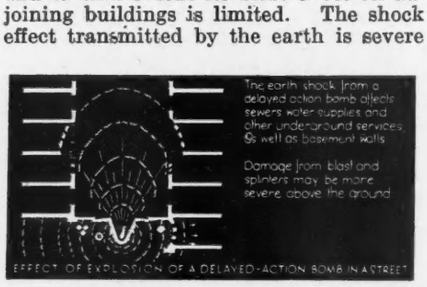
Confined Explosions.—102. Bombs exploding outside the building cannot be regarded as confined unless they fall in light courts or in narrow streets. If


In enclosed spaces such as this blast will be particularly destructive
EFFECT OF A PERCUSSION BOMB EXPLODING IN A LIGHT COURT

Diag. 25.

they do so fall the destructive effect on the building considered will be appreciably greater (Diag. 25).

Explosions on Paved Surfaces. — 103. A delayed action bomb falling in a street or paved area buries itself in the ground, and to that extent its blast effect on adjoining buildings is limited. The shock effect transmitted by the earth is severe


The earth shock from a delayed action bomb affects sewers water supplies and other underground services, as well as basement walls
Damage from blast and splinters may be more severe above the ground
EFFECT OF EXPLOSION OF A DELAYED-ACTION BOMB IN A STREET

Diag. 26.

and is liable to damage basement walls, but the effect above ground may be less severe than it would be with a percussion bomb of equal power (Diag. 26).

Upward Blast. — 104. Since the blast effect of delayed action bombs falling in the street is preponderantly upward, their effect on the structure of the adjacent buildings will depend upon their distance away from the explosion. Unless they are very close, the lower parts of the buildings are likely to escape the main force of the blast. The upward blast is, however, particularly destructive to " architectural features " such as cornices, eaves, pediments, porches, canopies and other projecting construction. Once dislodged or broken off such pieces of construction become very dangerous and destructive missiles.

Missiles and Debris. — 105. Constructions such as parapets, chimneys, fins, pinnacles, etc., which are not tied down to the structure, become extremely dangerous, because not only are they liable to be caught up by the blast but if that does not occur they may be dislodged by the shock of the explosion which is transmitted through the earth and the buildings in a way reminiscent of earthquake tremors. It is well known that relatively mild earth tremors cause chimneys and other projections to shear off, causing considerable damage in their fall.

106. The effects of percussion type bombs falling in streets and of delayed action bombs falling close to buildings or in narrow streets are to destroy the external walls over a considerable area, unless the walls are exceptionally massive.

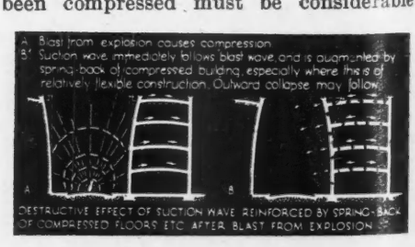
Resistance to Blast.—107. In the normal building of load-bearing wall construction the resistance offered depends upon the mass and construction of the wall and the horizontal and vertical buttressing provided by internal partitions and floors. Any precautions designed to increase the resistance of the wall and the strength and number of the buttresses will be of advantage.

Windows.—108. It has been stated that large window areas will materially reduce the danger to the solid wall because they do not confine the blast. This may be so unless the internal walls are also of heavy construction. If the internal walls are of heavy construction and the rooms of small dimensions the blast will still be confined, and either the external walls or the internal partitions or both must give way.

Resistance to Negative Pressure. — 109. The resistance offered by unframed construction to the pull of the suction wave is usually relatively weak, depending as it does mainly on the mass of the wall and the loading upon it.

Buttressing of Wood Floors. — 110. Wood floors, as normally constructed, contribute practically nothing to tie back the external walls to the building as a whole. Concrete floors are somewhat more effective in this respect, but where, as is usual, they have a bearing only 4½ in. wide on the inner side of the wall, the tie provided is not as effective as it might be.

The Reaction of the Construction. —111. The resistance of unframed construction to the thrust of the original blast is therefore usually greater than to the pull of the suction wave. The pull of the suction wave is aided by the reaction of the construction itself, since it is obvious that the " back lash " of a floor which has been forced up or the sudden expansion of a more rigid floor which has been compressed must be considerable


A. Blast from explosion causes compression
B. Suction wave immediately follows blast wave, and is augmented by spring-back of compressed building, especially where this is of relatively flexible construction. Outward collapse may follow
A
B
DESTRUCTIVE EFFECT OF SUCTION WAVE REINFORCED BY SPRING-BACK OF COMPRESSED FLOORS ETC. AFTER BLAST FROM EXPLOSION

Diag. 27. Diag. 28.

and sufficient in many cases to do much damage of itself without the aid of the suction wave (Diags. 27 and 28).

112. Two accounts of bombs which exploded in paved streets are quoted below:

(*a*) " We have had a recent example from Barcelona of the effect of a bomb estimated to be 1,000 kilo, the heaviest type there is, which fell in the centre of a street 50 yards wide—a very wide street. The buildings had stone fronts of rubble masonry with heavy cornices and stone

balconies, but otherwise are described by an engineer who made the report as being of a rather flimsy character. The maximum blast effect was felt over a radius of 150 ft., and the buildings on both sides of the street in the immediate vicinity were entirely demolished. It formed a crater some 30 ft. in diameter" (1).

(*b*) ". . . . another bomb hit the Nanking-road front of the Cathay Hotel at the seventh floor level . . . and fell down . . . to the street pavement where the explosion took place, causing a crater 3 ft. deep and 8 ft. diameter in the pavement. The ground and first floor windows were shattered by the concussion and fragments of shell and paving-stones penetrated through the windows and doors. . . . . The explosion also shattered the windows on the ground, first and second floors of the Palace Hotel . . . on the other side of Nanking-road (80 ft. wide) . . . and fragments of shell and paving-stones penetrated into the rooms . . ." (8). The Cathay Hotel is a steel-frame building with concrete floors, and the front is granite-faced. The stability of the brick was not affected.

113. External explosions are then likely to be less effective than direct hits; they are, however, liable to destroy walls or sections of walls, and for this reason load-bearing walls are dangerous. Walls are liable to be blown inward or sucked outward according to the circumstances and the type of construction. The conclusions, therefore, are much the same as those relating to direct hits: that some form of frame construction is desirable which will maintain the building even if a considerable amount of walling is destroyed.

SECTION III.
STRUCTURAL PRECAUTIONS IN BUILDINGS

114. A great deal of discussion at present revolves around the subject of precautions and protection, and much of it appears to be caused by the lack of accepted definitions and the confusion of building precautions with measures for the protection of the population. A great many people who have studied the question regard strengthened and gas-proofed rooms in existing buildings as death-traps, and not refuges, and agree in broad principle with the A.R.P. officer for the Borough of St. Pancras, who, after a visit to Barcelona, wrote (14): "The really serious point is that the population at large may be led to believe that if they possess no underground shelter any room on the ground floor will be suitable as a gas-proof room, providing its windows are protected from the blast and splinter effects of high explosive bombs by means of sandbags or boxes of earth."

"If there is one single fact which stands out stark and clear as a result of the air raids in Spain, it is that there is no protection for a civil population from the blast effects of H.E. unless they are in underground shelters."

Precautions and Protection. — 115. For this reason the subject of structural work in air raid precautions must be divided into two distinct sections: (1) Structural precautions in buildings; and (2) the construction of protected accommodation. The two sections overlap only where protected accommodation is to be provided in or under buildings. Structural precautions in buildings if carried out will, it is true, save the lives of many people *if they have not been provided with protected accommodation.* But since none of the measures coming under the heading of Structural Precautions in Buildings are designed to *resist* air attack but merely to reduce secondary damage they cannot be regarded as an adequate measure of direct protection for individuals.

The Practical Objects.—116. The objects of structural precautions in buildings are, taken in detail, many and varied, but they may be defined broadly as:—

(*a*) To reduce the likelihood of total collapse in the event of part of the building being seriously damaged.

(*b*) To reduce the amount of secondary damage to the building and to adjacent buildings caused after the explosion itself by flying missiles and falling masonry.

(*c*) To ensure that the building will resist blast effects to the maximum extent possible with the form of construction used.

117. The ways of achieving these objects in new buildings are, of course, entirely different from those which must be adopted in the existing buildings and must be examined separately.

PRECAUTIONS IN EXISTING BUILDINGS.

Load-bearing Walls.—118. Every existing building must be examined on its own merits and the precautions to be taken will depend mainly upon the type of construction and the age or state of repair of the structure. Old buildings of the normal type with solid masonry load-bearing walls and timber floors and roof are extremely difficult to deal with, and in most cases it will be found that no major structural precautions can be taken without practically reconstructing the building.

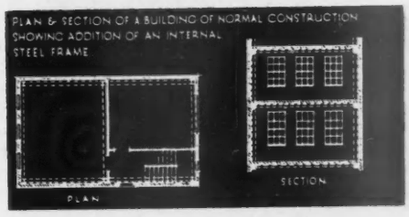
119. The following notes summarise some of the steps which may be taken to improve the resistance to blast effect of such buildings and to reduce the secondary damage likely to occur in the case of an explosion on, in, or near the building. Which of these steps should be taken in any given case can, of course, only be determined in the light of a knowledge of the state of the building concerned, the limit of cost and the "level of effectiveness" required.

FRAMING.

120. The major fault from an A.R.P. point of view in construction with load-bearing walls is that if part of a wall is destroyed that part of the remaining construction which it was supporting is also brought down, usually bringing with it further work not primarily affected by the original explosion.

Incorporating a Frame.—121. Wherever fully effective measures are required, a supporting frame should be incorporated in the existing building to carry the floors, and as much of the walls as possible, should the original supports be destroyed.

122. In many cases it will be impracticable to incorporate such a frame, and in many more the cost will be prohibitive. It is, however, often possible in the simpler types of building to construct a frame within the building, keeping the columns and beams on the internal face of the walls. Such a frame will readily take the floor loads since if the floors are of timber the joists will run over the new beams into the existing walls, but



Diag. 29.

it is extremely difficult to design a means of carrying the external walls on this frame without practically reconstructing them (Diag. 29).

Tying External Walls. — 123. A large measure of support and greatly increased stability can, however, be obtained by tying the wall back to the frame at frequent intervals. If there are steel or concrete window lintels it may be possible to back them with a new beam to which they can be anchored; similarly if, as sometimes occurs, there is a continuous lintel over a series of openings it should be anchored back to the new framing. In certain circumstances it may be possible to provide brackets under the lintel so that not only is it tied back but it will in an emergency be carried by the framing.

Mixed Construction. — 124. That form of construction usually known as mixed construction and consisting of a system of internal beams and columns in conjunction with load-bearing walls must not be regarded as a framed building in the A.R.P. meaning of the phrase.

Completing a Partial Frame.—125. From the point of view of blast effects a partial frame is just as bad as a building wholly constructed with load-bearing walls. It is, however, a simpler problem, because the new framing required will consist only of columns and beams on the external walls which can be linked to the ends of the existing beams relatively easily. In many cases the existence of a wall beam in the external wall will solve to some extent the problem of carrying the wall at each floor level.

Fireproofing the Frame. — 126. A steel frame of the kind outlined above will be *capable* of taking the various wall and floor loads in case of emergency, but since it will not in most cases be built-in and wedged up to take those loads before that time, it is probable that the local authorities will not require the steelwork to be fireproofed. Fireproofing is, of course, desirable, although not essential, and it would probably be provided most readily by using sectional casing such as precast concrete units or clay or asbestos-cement sections.

EXTERNAL WALLS.

Thickness. — 127. In most unframed multi-storey buildings the external walls are fairly thick (13½ in. or 18 in. brickwork) on the lower floors, and although the maxim "the thicker the walls the greater the protection" applies, it is difficult to justify thickening such walls in normal buildings.

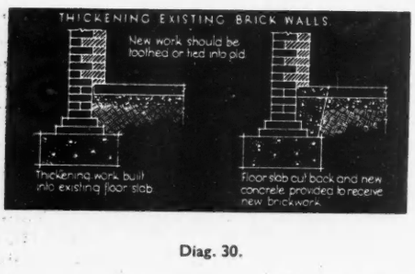
128. If we were to adopt, say, 1 ft. 10½ in. or 2 ft. 3 in. walls as the minimum, we would be approaching the state of building air-raid-resisting buildings, and adjusting them for normal use, whereas our present attitude toward the subject

is that our buildings should remain normal, but should be adjusted for A.R. resistance as far as possible—an entirely different matter.

Cavity and 9-in. Walls. — 129. The general principle which appears to be gaining acceptance is that the minimum desirable wall should be 13½ in. brickwork or its equivalent. This, of course, is based on the Home Office recommendations for blast and splinter resisting walls; 11-in. cavity walls and 9-in. solid walls should, therefore, be strengthened wherever possible. This strengthening is intended to increase the stability of the wall against overturning or destruction by blast, but it is also intended to increase resistance to penetration by splinters and fragments.

Piers and Thickening Walls. — 130. The addition of piers or buttresses at intervals will increase stability, but it will not increase resistance to penetration; the general thickening of the wall throughout its length and height is therefore preferable. Such thickening should be bonded into the existing wall as much as possible; thorough bonding will, of course, not be practicable except at great expense.

131. Generally the most expensive part of such thickening work will be in forming a suitable foundation for the extra brickwork, particularly when the ground floor is a concrete slab. In such cases


THICKENING EXISTING BRICK WALLS
New work should be toothed or tied into old
Thickening work built into existing floor slab
Floor slab cut back and new concrete provided to receive new brickwork

Diag. 30.

the new work may be built on to the existing slab without any new foundation work, although full value will not then be obtained in increased stability (Diag. 30).

WINDOWS.

132. There is at present some doubt as to whether it is better to leave window openings unprotected so that they may act as safety valves in the event of an explosion either inside or outside the building, or protected so that they will resist equally with the walls.

133. The factors involved in protecting openings with heavy shutters, removable slabs or sandbags can be summarised briefly:—

(*a*) Assuming that the protection given is equal in resistance-value to the adjoining walls, the interior of the building will be fully protected up to this level from blast and fragments.

(*b*) In the event of external explosions, blast which can be resisted by the walls should leave the building completely undamaged internally.

(*c*) If the window area is large and is left unprotected, and if the interior of the building is sub-divided with heavy walls, blast entering the windows is liable to be extremely destructive. (See case described by Haldane, already quoted.)

(*d*) If the rooms served by the windows are enclosed by heavy internal walls, their effect as safety valves is limited.

(*e*) In the event of an explosion inside the building, protected windows will serve to confine it, and thus to accentuate and increase the resulting damage.

(*f*) In the event of an explosion outside the building but in an enclosed or partly enclosed space, such as a light court, courtyard or narrow street, protection over the windows would be likely to have a very serious confining effect and would therefore be very likely to increase the structural damage resulting.

134. Amongst these conflicting factors it is difficult to state any single guiding rule, but it would seem that:—

(*a*) In buildings surrounded by wide streets or open spaces and without internal courts, the value of the protection against external explosion given by protected windows would be sufficiently great to justify the risk of increased damage in the event of a direct hit.

(*b*) In buildings surrounded by narrow streets and with enclosed areas, such as light courts and courtyards, the danger of increasing the damage caused by either interior or exterior explosion would be so great as to outweigh any advantages.

135. These considerations would also apply in relation to building-up unused windows or reducing the size of existing ones.

Shutters and Fillings.—136. The actual methods to be adopted to protect windows include heavy steel or composite sheet steel shutters and units of like construction, intended to be kept in store and fixed in position only in an emergency, and precast concrete slabs or brickwork intended to be built into position when the emergency occurs. Any method which takes an appreciable time to fit or build is, of course, likely to leave the building unprotected during the first attack or attacks. Since, however, the first attack is likely to be but a small item in comparison with what is to follow, this is perhaps not as great a fault as it at first appears. If brick or concrete is to be built into position at the time of the emergency it is essential that all material, and preferably all essential tools and scaffolding also, should be prepared and stored ready for use.

137. Shutters and removable frames are both difficult to anchor adequately to the wall if they are set in the reveals of the openings. It is usually best to make them larger than the opening so that they overlap the brickwork all around; if they are fitted on the outside of the wall the force of an external blast will then be transmitted to the wall directly by the bearing edges and not through lugs or other anchorages. In the case of an internal blast the strength of the shutters would depend upon the fixing lugs which, if the pressure was great, would probably fail—as is desirable.

FLAT ROOFS.

Resistance to Penetration.—138. It is usually suggested that roofs should be made strong enough to resist penetration by the smaller types of incendiary bomb which can be broadcast in thousands. Whether the heavy expense involved in providing this protection in existing buildings is justified is doubtful, in view of the fact that there is no certainty that such bombs will be used. On the contrary, it is not an unreasonable supposition that much heavier incendiary bombs will be used since the small ones do not appear to have been very satisfactory in Spain.

Fireproofing. — 139. Since at best we can expect both heavy and light types to be used, and since it is not practicable to prevent penetration by the larger bombs, it would probably be more effective to concentrate on fire-proofing all the construction and finishing materials rather than on providing relatively expensive additional construction designed only to keep out some of the bombs.

Strengthening Concrete Roofs. — 140. The Home Office states that a 5-in. concrete slab is sufficient to prevent penetration by the 2½-lb. (1 kilo) incendiary bomb. Existing solid roof slabs can be thickened by laying 2 in. or more of concrete over the existing surface, preferably with light two-way reinforcement.

Strengthening Hollow Block Slabs.—141. Roof slabs constructed with hollow floor blocks are unlikely to give resistance equal to the 5-in. solid slab, because there is usually only 1½ in. to 2 in. of concrete over the hollow blocks. The increased solid thickness required can be obtained by laying 3 in. or 4 in. of concrete on the existing surface unless the dead weight of the new concrete is objectionable.

False Ceilings.—142. An alternative is to provide a false ceiling beneath the slab, formed of one of the proprietary sheet materials, which must be sufficiently strong and fire-resisting for the purpose. The ceiling must be unusually well supported with good framing and an ample number of hangers, all in metal. The ceiling to be effective must be sufficiently strong to stop the bomb after its velocity has been checked by the slab above, and must be sufficiently fire-resisting to support it while it burns out.

Sheet Coverings. — 143. A further alternative is to lay over the roof slab a complete covering of this sheet material either bedded directly on to the surface or set in a metal framing. In either case the existing roofing should be removed if it is likely to be inflammable; a new roof covering will then be required.

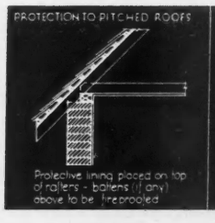
Timber Construction. — 144. This method is also the most suitable one for increasing the resistance of timber flat roofs. With timber construction the use of a fireproof false ceiling is unsuitable since it would allow the bomb to burn out amongst the timbers.

PITCHED ROOFS.

145. There are relatively few buildings in this country with pitched roofs above a solid concrete ceiling slab, but where they do exist, providing the slab is 5 in. thick and solid for its equivalent, the only measures which need be taken are to fireproof all roof timbers above or to remove the pitched roof entirely and lay a roofing material over the top slab.

146. There are several ways of increasing the resistance of pitched roofs, and they may be summarised as follows:—

(*a*) To strip off the roof covering and lay protective sheeting over the rafters, or in the case of roofs with truss and purlin construction, over the purlins, relaying the roofing without wood battens or other timber (Diag. 31).



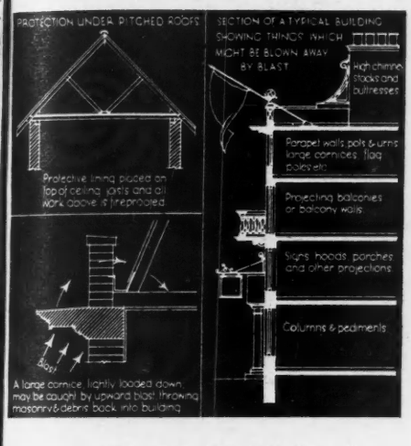
Diag. 31.

Diag. 32.

(*b*) To fireproof the rafters and battens with a fireproof paint or other coating and to line the underside of the rafters

with fire-resisting sheet material of adequate strength (Diag. 32).

(*c*) To fireproof the roof timbers and to lay the fire-resisting sheet material on top of the ceiling joists. This method allows the bomb to penetrate the roof itself, the sheeting over the ceiling joists being intended to stop the bomb after its


PROTECTION UNDER PITCHED ROOFS
SECTION OF A TYPICAL BUILDING SHOWING THINGS WHICH MIGHT BE BLOWN AWAY BY BLAST
High chimney stacks and buttresses
Parapet walls pots & urns large cornices flag poles etc.
Protective lining placed on top of ceiling joists and all work above it fireproofed
Projecting balconies or balcony walls
Signs hoods porches and other projections
Columns & pediments
A large cornice lightly loaded down may be caught by upward blast throwing masonry & debris back into building

Diag. 33 (top left). Diag. 34 (right) and Diag. 35 (lower left).

velocity has been checked and to provide a surface on which it can burn out.

(*d*) A combination of (*c*) with either (*a*) or (*b*) to obtain greater resistance (Diag. 33).

(*e*) To remove the pitched roof entirely and replace the ceiling with a 5-in. concrete slab forming a flat roof.

(*f*) To build over the ceiling, or in place of it, a 5-in. concrete slab. In certain cases the existing ceiling would serve as permanent shuttering and with adequate temporary support the concrete could be poured directly upon it.

147. Pitched roofs with steel framing may be dealt with similarly except that the structural members will not require to be painted with fire-resisting paint; it would be impracticable to give such members the fire-resisting covering usual for steel framework.

PARAPETS, CORNICES AND OTHER PROJECTING FEATURES.

Parapet Walls.—148. Parapet walls are seldom anchored to the main structure in any way or buttressed by any adjoining work; they usually depend for their stability entirely upon their own weight. They are liable to become dislodged by blast or by flying fragments, and are then likely themselves to become dangerous missiles or to form heavy falling debris (Diag. 34).

149. Parapet walls on existing buildings should be either anchored down, stayed frequently, or (preferably) removed. Urns and other standing ornaments should be removed.

Cornices.—150. It is almost impossible to strengthen in any way projecting cornices, yet they are particularly dangerous because they are liable to catch the upward blast, particularly from delayed action bombs. When they are in or directly under parapets, and therefore only lightly loaded, they are liable to cause great damage by overturning the parapet (Diag. 35).

151. Small cornices may perhaps be allowed to remain, but a cornice with a large overhang or projection should be either removed or cut back to a new profile.

Hoods, Signs, Etc.—152. Similarly, all other non-structural projecting members, such as porch roofs, hoods, signs, etc., should be either adequately anchored down or (preferably) removed.

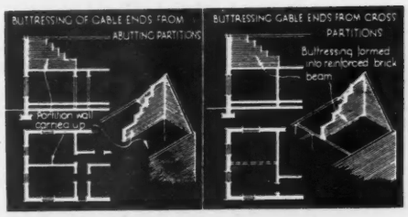
Chimneys.—153. The free-standing part of a chimney-stack neither buttressed nor tied to any adjoining structure is liable to be overturned by blast pressure or dislodged by the shock or earth-tremor effect of a large delayed action bomb.

If such stacks are unnecessarily high they should be taken down to the lowest possible level, and in any case they should be stayed and tied to any convenient adjoining structure.

GABLE ENDS.

154. Gable ends in normal buildings are usually merely filling panels carrying little, if any, weight, and neither tied nor buttressed in any effective way. They are therefore extremely dangerous and very liable to be either blown in by blast or drawn out by suction wave after an explosion.

155. Gable ends, particularly if they are of solid material (brick, block or concrete), should be both buttressed and tied to the structure. If an internal partition abuts the wall below the gable, it may be carried up into the roof space and toothed into the brickwork of the gable to provide good buttressing and a reasonably good tie (Diag. 36).


BUTTRESSING OF GABLE ENDS FROM ABUTTING PARTITIONS
Partition wall carried up
BUTTRESSING GABLE ENDS FROM CROSS PARTITIONS
Buttressing formed into reinforced brick beam

Diag. 36. Diag. 37.

156. Where there is no such partition it may be possible to build in a beam of steel, reinforced concrete or reinforced brickwork from the base of the gable to the nearest parallel partition, and on this beam to build the buttressing toothed into the gable (Diag. 37).

EXISTING FRAMED BUILDINGS

157. For existing framed buildings, A.R.P. requirements differ from those already outlined above only in respect to the outer walls and the frame. The frame is the most valuable feature from an A.R.P. point of view, because the destruction of one portion is unlikely to cause the collapse of the remainder.

158. The other factors described in relation to other existing buildings apply to framed buildings and may be summarised as follows :—

(*a*) External walls should be made equivalent to 13½ in. brickwork or more.

(*b*) Windows in certain circumstances should be protected.

(*c*) The roof may be strengthened to give resistance to penetration equivalent to 5 in. of solid concrete.

(*d*) All possible structural members and finished surfaces should be fireproofed.

(*e*) All free-standing or projecting features such as chimneys, parapets, cornices, hoods, canopies, etc., should be removed or stayed and tied to the adjoining structure, preferably to the frame.

PRECAUTIONS IN NEW MULTI-STOREY BUILDINGS

Framed Structures.—159. The study of Air Raid Precautions inevitably leads to the conclusion that all buildings, large and small, must in future be framed structures. This framing, particularly in small buildings, need not be of the accepted steel or reinforced concrete type, but it should be capable in an emergency of so taking the loads that the destruction of one part need not necessarily cause the collapse of the remainder.

160. In buildings of many storeys, such as office blocks, blocks of flats and industrial housing, the general method of framing normally used in the past will remain unaltered, but careful consideration must be given to the type of panel wall used and to the roof construction.

EXTERNAL WALLS.

Safety Valve Walls.—161. No data are at present available to the public on which to base an estimate of the value of "safety valve" walls as against walls tied to the frame. Subject to the results of and conclusions which may be drawn from actual tests, it would seem that there are advantages in favour of the "safety valve" wall and dangers in the use of "tied walls" which would justify the adoption of the safety valve type for all future work.

162. The factors involved have already been discussed to some extent in relation to the protection of windows; they must, however, be repeated here because their bearing on the subject of panel walls for framed buildings is a vital one.

(*a*) An explosion outside but near to a building will tend to blow the external walls inward and to draw them or part of them outward with the suction wave following the blast.

(*b*) If the bomb falls in a narrow street or in an enclosed court, the resistance offered by the external or enclosing walls will affect the amount of damage done to the opposite and adjacent walls.

(*c*) An explosion inside a building (from a delayed action bomb) will tend to blow the external walls outwards, and the amount of resistance offered will affect the amount of the damage done to the floors, to the frame of the structure and the internal partitions.

(*d*) Walls which are reinforced will probably resist greater blast pressure and greater impact than unreinforced walls.

(*e*) Walls which are so reinforced and tied to the frame of the building will be likely to resist greater blast pressures than a similar wall not tied to the frame. If, however, the wall is destroyed, the frame is also likely to be seriously damaged.

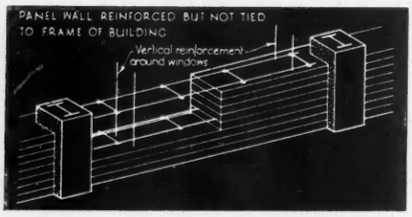
(*f*) Walls of a light type or which are not reinforced and tied to the frame will blow in or out relatively readily, and while releasing the pressure of the blast to some extent, they are liable to cause great damage in falling, and parts of them are likely to form very dangerous and destructive missiles.

Reinforced Walls.—163. It will be appreciated that, compared with the unreinforced wall, a heavy wall, reinforced and tied to the frame of the building, will resist better all light and medium blast pressures, whether from within or without, but that the destructive effect of a particularly heavy blast pressure is likely to be greater and more damaging to the structure. A wall which is not tied to the frame will resist blast pressures up

to the limit of its own strength, and will then collapse without causing the destruction of the frame.

164. The term "safety valve" wall is likely in one sense to be misleading, because it implies that the wall is intended to collapse under blast pressure. This, of course, is not the primary object of using this type of wall. The wall itself may (and should) be designed to resist blast to the maximum, but it should be designed so that when the limit of resistance is reached the collapse of the wall should not necessarily cause the destruction of the frame or of part of it.

165. On the whole, the balance of advantage appears to be in favour of a reinforced wall in which the reinforcement is not tied to the frame (Diag. 38).



Diag. 38.

166. By adopting this system, the strength and resistance of the wall itself are increased without increasing the danger of damaging the frame even under severe blast pressures. A further advantage of reinforcement in a wall is that it should reduce the liability of parts of the wall to become missiles. In all block and brick construction this factor is of some importance because, on collapsing, an unreinforced wall tends to break up into the original individual units, which then readily become missiles. Reinforcement tends to hold the mass together even after collapse, yet in brick and block construction it does not prevent ultimate removal in relatively small pieces. This, too, has been found to be important, because wherever people are likely to have been buried under the debris, clearing away must be carried out by hand with considerable care so that those who remain alive may be saved. This can only be done if the debris can be readily broken up into sizes small enough for manual removal.

ROOFS AND FIREPROOFING.

High Explosive Bombs. — 167. It is generally accepted that it is not practicable to provide on normal buildings roofs which would resist penetration by high explosive bombs. A very high degree of protection is required against even the lighter types of percussion bomb (exploding on impact), and the high cost of this protection could hardly be justified because it would not resist the heavy types of bomb nor delayed action bombs.

Incendiary Bombs.—168. This being so, it remains to consider whether effective protection can be given against incendiary bombs. It has already been stated that a 5-in. solid concrete slab is recommended as giving sufficient protection to prevent penetration by a 2½-lb. bomb (1 kilo.).

Resistance to Penetration. — 169. The level of protection obtained with a 5-in. concrete slab is a purely arbitrary one, yet any other level decided upon could only be arbitrary too, since we have no knowledge of the maximum weight of incendiary bombs which will be used.

Fireproofing. — 170. It seems, then, reasonable to recommend the use of a 5-in. solid concrete roof slab or its equivalent, in resistance to penetration and to fire, for all future buildings, and to concentrate all other precautions against incendiary bombs on fireproofing, so that there will be as little as possible inflammable material in the structure, finishing or furnishings.

Localising Fire.—171. It will, of course, be impossible to ensure that all the furnishings and contents of a building are fireproof, and for this reason consideration should be given to localising every outbreak of fire by dividing up the building with fireproof barriers, both horizontally and vertically, so that it is divided into a series of relatively small cells, each capable of confining the fire should the bomb explode within the cell. This system of subdivision will be a further development of that already required by building regulations for most large types of building, but the units or cells should be very much smaller.

Fire-resisting Doors. — 172. The adoption of such a system will affect planning, both horizontally and vertically, and construction, and will require the development of a simple type of fire-resisting door which will be self-closing in the case of fire, but can be opened and shut in the normal way for normal use. Its adoption should not increase the cost of the building to any appreciable extent, and it should not seriously affect the normal planning of the building.

Floor Construction. — 173. Fire-resisting floor construction will be required in all floors, and the greater its resistance to impact and penetration the better. The heaviest bombs may be capable of penetrating all floors to the ground, but intermediate sizes will be brought to rest on intermediate floors if the floor construction offers effective resistance, and, obviously, the fewer the storeys penetrated the better.

Solid Slabs.—174. Solid floor construction, such as solid concrete slabs or reinforced brickwork slabs, is therefore to be preferred to hollow construction in which the ribs would offer effective resistance but the hollows would not.

WINDOWS AND OTHER OPENINGS.

175. It has been suggested that window cills should be at a rather higher level above the floor than is usual; that windows should (subject to lighting requirements) be smaller; and that in certain cases windows which would normally be provided could be omitted altogether.

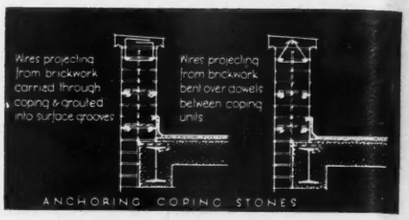
176. If structural precautions are based upon protection of property, and not upon protection of persons, then there does not appear to be any great value in reducing window area. Larger windows would, if anything, tend towards increasing the damage to furniture and fittings and decreasing the danger to the structure.

PARAPETS AND BALUSTRADES, CANOPIES AND OTHER PROJECTIONS.

177. Parapets are, owing to their position, difficult to anchor, stay or buttress. Open railings well anchored and stayed are to be preferred to solid parapets, but where solid work is to be used it should be reinforced, anchored, stayed and buttressed as solidly as possible.

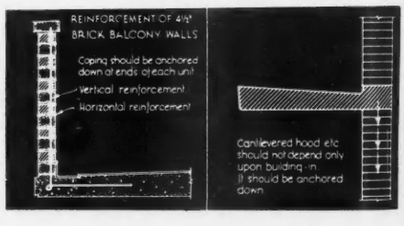
Parapet Walls and Copings.—178. Parapets in brickwork can be reinforced in the horizontal joints and the reinforcement linked to vertical reinforcement carrying down into the wall below or into the roof slab. Coping-stones have proved to be both dangerous and destructive, since they are readily dislodged by blast or shock from blast; they should be anchored down or linked to the vertical reinforcement in the parapet (Diags. 39 and 40).

Diag. 39.


Wires projecting from brickwork carried through coping & grouted into surface grooves
Wires projecting from brickwork bent over dowels between coping units
ANCHORING COPING STONES

Diag. 40.

Balustrades, Balcony Walls, etc. — 179. External balustrades, balcony walls, and the like are also dangerous features which, if they must be used, should be strengthened in much the same way as parapets; open metal railings and balustrades are, however, much to be preferred—they are safer in an emergency, easier to secure and more economical (Diag. 41).


REINFORCEMENT OF 4½" BRICK BALCONY WALLS
Coping should be anchored down at ends of each unit
Vertical reinforcement
Horizontal reinforcement
Cantilevered hood etc should not depend only upon building-in. It should be anchored down

Diag. 41. Diag. 42.

Canopies.—180. Although they are, in modern work, usually solidly constructed in concrete, canopies, balcony slabs and like cantilever features are dangerous in the case of a near explosion, since they are liable to catch the violent upward blast, which is particularly strong from delayed action bombs. If they are not omitted altogther in future work, they should at least be kept as small as possible with small projections, and they should be rather more heavily reinforced than would otherwise be necessary. They should never depend for their security merely upon being built into a panel wall; they should always be well anchored to the structural frame (Diag. 42).

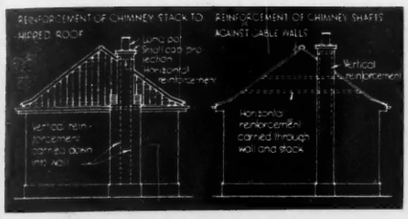
CHIMNEY-STACKS.

181. Chimney-stacks are always vulnerable features, and no rules can be laid down for their treatment except that, generally, they should be built against adjoining construction for the greater part of their height or else kept as far away as possible from adjoining buildings, so that should they collapse the damage will be kept to a minimum.

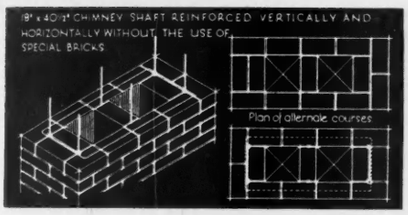
182. If a stack is carried up the greater part of its height within or against a building and bonded to the structure, the

upper part above the building should be buttressed and stayed as much as possible.

183. Brick stacks, both large and small, can be reinforced horizontally and vertically to give them far greater stability. It is possible that a reinforced stack falling in large sections would be more destructive than one unreinforced which broke up into its small units as it fell. This possibility may not appear so serious (except perhaps for large industrial stacks) when it is realised that a blast which destroyed a well reinforced chimney would


REINFORCEMENT OF CHIMNEY STACK TO HIPPED ROOF
REINFORCEMENT OF CHIMNEY SHAFTS AGAINST GABLE WALLS
Vertical reinforcement
Horizontal reinforcement carried through wall and stack
Vertical reinforcement carried down into wall

Diag. 43.


19" x 40" CHIMNEY SHAFT REINFORCED VERTICALLY AND HORIZONTALLY WITHOUT THE USE OF SPECIAL BRICKS
Plan of alternate courses

Diag. 44.

almost certainly have also destroyed the adjoining construction (Diags. 43 and 44).

PRECAUTIONS IN NEW SMALL SINGLE- AND MULTI-STOREY BUILDINGS.

184. The heading to this section is intended to cover all those smaller buildings which go to make up the greater part of the annual building programme in this country. One-, two- and sometimes three-storeyed buildings for industrial or commercial use, for entertainment or for living accommodation, are so numerous that they form the most important section of building work, yet the individual units are relatively small, and any appreciable increase in cost would in many cases mean postponement and perhaps abandonment of the work.

185. The greater part of this work does not (although it should) come within the field of the architect; it is almost all built in brick, with either wood or concrete floors; structurally it is usually sound, although the finishing materials and detail craftsmanship are frequently poor.

186. In this main group is included that small proportion which is controlled by architects, and the domestic house. In the main the whole group is built to the same principles. The main differences between the best and the worst lie in the detail and finishing materials and in the care and craftsmanship employed during building. The precautions suitable for one will, then, be suitable (broadly speaking) for them all.

Cost of Precautions. — 187. Precautions in this class of work will be controlled rather more rigidly by the cost factor than is the case in larger buildings; they must therefore be designed with this in view, or it is likely to be found that they are simply omitted on the score of expense. This is not to suggest, however, that they should be less thoroughly designed or less efficient.

188. In small buildings of this kind, the type of floor construction used will determine to a large extent the way the principles of A.R.P. can be applied; it will be most convenient then to consider buildings with timber floor construction separately from those with concrete or other solid floors.

BUILDINGS WITH SOLID SLAB FLOORS.

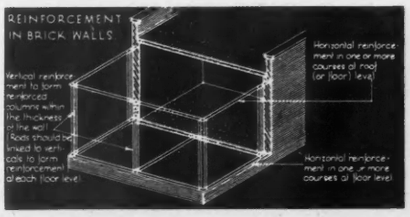
Value of Solid Floors.—189. Under this heading will be included many small commercial and industrial buildings and some few domestic houses, all of them usually built with solid or cavity brick walls and the majority with flat roofs. The value of solid floor and roof construction in this type of building cannot be over-emphasised because, while it offers some resistance to the penetration of lightweight bombs, it is fire-resisting and it provides a resistance to thrust on the external walls greater than can be obtained by any other practicable means. If the solid floor construction is linked to external wall and column reinforcement, it also provides a greater resistance to the pull of the suction wave than otherwise can be obtained. Here, again, solid brick or concrete slabs are to be preferred to hollow floor construction.

Framing.—190. As is the case with the larger multi-storey buildings, it is essential to incorporate in the construction some form of frame which, although it need not carry the building wholly in the accepted sense of the term "framed construction," should nevertheless be so designed that it will support the building in an emergency should some part of it be destroyed.

Cost of Framing. — 191. The conventional steel or concrete frame construction fulfils this definition completely and is entirely suitable. It has, however, not been applied largely to this class of building in the past, probably owing to the cost. The adoption of framed construction in small buildings does not produce economies proportionate with those obtained in large, tall buildings. Since the economic factor is vital in small work, the extra cost of framing will in many cases prevent its adoption.

192. The use of reinforcement in the brickwork to form columns within the walls may be found to provide the necessary vertical framing without appreciable increase in cost.

Subsidiary Framing.—193. In this type of building the floor slabs usually bear upon the interior or exterior walls, and would therefore be liable to collapse should a wall or part of a wall be demolished. If horizontal reinforcement is provided in the brickwork at floor level and vertical reinforcement at intervals throughout the length of the wall, a subsidiary framing will be formed which can be designed to carry the floors and super-


REINFORCEMENT IN BRICK WALLS
Horizontal reinforcement in one or more courses at roof (or floor) level
Vertical reinforcement to form reinforced columns within the thickness of the wall. (Rods should be linked to vertical reinforcement at each floor level)
Horizontal reinforcement in one or more courses at floor level

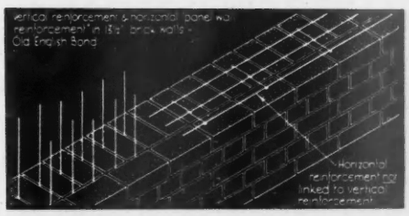
Diag. 45.

structure should the panels of brickwork between be destroyed (Diag. 45).

Interior Walls.—194. The interior walls should be similarly treated so that a beam is formed in every wall at each floor level unless a wall beam is formed in the floor construction.

Linking Reinforcement.—195. Throughout the work the horizontal reinforcement in the external and internal walls should be linked together wherever possible, and the vertical reinforcement in the walls should be linked to the floor construction to provide a tie to resist the suction wave from an external explosion.

196. The wall areas between the sections which are reinforced vertically as columns can with advantage be reinforced horizontally to increase their strength;


Vertical reinforcement & horizontal panel reinforcement in 9½" brick walls
Old English Bond
Horizontal reinforcement not linked to vertical reinforcement

Diag. 46.

this reinforcement should, however, in no circumstances be linked up with the columns (Diag. 46).

197. The other factors described in relation to the larger framed buildings apply to this smaller work, and may be summarised as follows:—

(*a*) Walls should be 13½ in. or its equivalent.

(*b*) Roofs should be 5 in. solid concrete or its equivalent.

(*c*) Windows in some circumstances should be protected.

(*d*) Cornices, hoods and other projections should be avoided or else be abnormally well anchored.

(*e*) Parapets should be avoided, and open grilles or railings used. If parapets must be used, they and their copings should be abnormally well anchored to the structure.

(*f*) Chimneys should be reinforced vertically and horizontally and built against adjacent construction if possible.

(*g*) All external members liable to be dislodged or torn away by the blast of an explosion should be avoided or especially anchored and stayed.

(*h*) All structural work, finished surfaces, furniture and fittings should be fireproofed as far as possible.

BUILDINGS WITH TIMBER FLOORS AND ROOFS.

Timber Floors.—198. Timber floors and roofs do not offer as much resistance to penetration or fire as solid slab construction, nor do they provide such effective buttressing and tying to the external walls. They will, however, continue to be used, and it remains to consider how these qualities can be improved or provided by other means.

199. Sheet steel or composite sheet linings can be provided on pitched or flat timber roofs to resist penetration by the lightweight incendiary bombs, but there is some doubt if the expense of such linings is justified in the absence of any guarantee that only lightweight incendiary bombs will be used.

200. If, for instance, the weight of the bomb commonly used should be slightly greater than those provided for, or its penetrative capacity is increased by improved design, then the protection provided will be valueless and the cost entirely wasted. For this reason it may prove more valuable to devote the re-

sources available to fireproofing the materials.

Roof Lining.—201. If, however, it is considered desirable to provide some resistance to the penetration of light-weight incendiary bombs, then one of the proprietary sheet materials of adequate strength and resistance to fire may be fixed over the rafters or on top of the ceiling joists or in both positions. The rafters and ceiling joists may require to be either larger or more closely spaced than is usual to give adequate support to the sheet material.

Sheet Materials. — 202. It should be appreciated that only specially designed sheet materials are suitable for the purpose; they must offer far greater resistance to impact and have far higher fire-resisting qualities than are obtained in the common roofing and other sheet materials.

Strength and Fire Resistance of Sheeting.—203. The velocity on impact of a small incendiary bomb is likely to be in the neighbourhood of 450 ft. per second, and some of the incendiary materials burn at temperatures up to 3,000 deg. C. The sheeting and the substructure which supports it must be capable of withstanding the impact of a small bomb travelling at this velocity, and the sheeting must also be capable of withstanding temperatures of this order during the relatively short time they are generated.

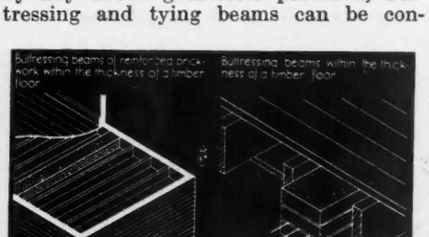
Lining Ceiling Joists. — 204. If the lining is placed on top of the ceiling joists, great care must be taken to fireproof as far as possible all the timber construction above.

Fireproofing Floors. — 205. The intermediate floors in the building should be fireproofed with a suitable liquid, paint or coating, and with fireproof linings above and below the joists.

Solid Lowest Floor.—206. In this form of construction it must be anticipated that any large or medium sized incendiary bomb registering a direct hit will penetrate both roof and floors until it reaches the ground; it would therefore be an advantage if the lowest floor (ground or basement) were solid and incombustible, so that whether the bomb came to rest upon it or penetrated into it, it could burn itself out relatively harmlessly.

Walls. — 207. The exterior and interior walls, if of brick or block, can be reinforced vertically and horizontally to form a subsidiary frame, as has been suggested in the previous section for buildings with slab floors. The exterior walls will, however, be buttressed only by such interior walls as may butt against them. No appreciable buttressing or tying can be obtained from the timber floors.

Buttressing and Tying. — 208. Where there are long lengths of wall unbroken by any abutting interior partition, buttressing and tying beams can be constructed in reinforced brick or concrete, spanning between the external walls and the nearest solid parallel partition. Such beams may sometimes be kept within the thickness of the floor, running between the joists; they need not carry any load, but the outer ends should be linked to the horizontal reinforcement in the external walls, and the inner ends (on the partitions) should be anchored as securely as possible, or continued across the full width of the building to the opposite external wall (Diag. 47).


Buttressing beams of reinforced brick-work within the thickness of a timber floor
Buttressing beams within the thickness of a timber floor

Diag. 47.

209. In other respects the precautions are similar to those required for other types of building, which have been summarised in preceding sections.

Summary.—210. In concluding these sections, which outline the major factors in designing structural precautions for the protection of buildings and the reduction of damage, and which outline some precautions which might prove of value, it must be emphasised again that they are not (and are not intended to represent) recommendations or even generally accepted methods; they are no more than an attempt to summarise the position as it at present stands. In the absence of A.R.P. Handbook No. 5, publication of which has been so long delayed, or of any recommendations by recognised technical institutions, there can be no basis from which to work other than individual judgment.

PRECAUTIONS AGAINST CONTAMINATION BY GAS

211. A.R.P. Handbook No. 4, "Decontamination of Materials," describes at some length the liability of building materials to become contaminated with liquid gas and the methods of decontaminating them.

Any permeable material is likely to absorb liquid gas which comes in contact with it, and once absorption has taken place little can be done to accelerate natural decontamination (evaporation). As a rule decontaminating methods deal with liquid on or near the surface, but they have no appreciable effect on the gas absorbed into the interior. Materials which have absorbed any considerable quantity of gas must therefore be allowed to decontaminate themselves naturally or be removed.

Practically all building materials except the metals are permeable and liable to absorb liquid gas unless they have a fired glazed surface. Glazed bricks, tiles, faïence and such materials and the sheet metals might with advantage be used rather more than in the past where they are suitable for normal purposes, because, except for the joints, they offer highly resistant surfaces. It does not, however, seem necessary to carry the precautions in normal building further than that.

Gas contamination is more likely to occur externally than internally, and consideration must be given more to external walls, roofs and pavings than to other parts of the structure.

It must be remembered, however, that gas bombs may be of considerable size and are likely to do appreciable local damage on impact, so that a glazed surface is not likely to prevent local contamination, although it can be readily decontaminated where it has only been splashed.

Practically all the normal roofing materials will absorb or be affected by liquid gas, and if contaminated would require surface decontamination and then either be left to evaporate or be removed. Large gas bombs can be expected to go right through normal pitched and flat roofs, whether of wood or concrete. Smaller ones might be stopped by solid flat roofs.

Practically all the flat roof materials and finishes, such as pavings, cement screedings, bituminous sheetings and asphalt, would either absorb or be affected by liquid gas, and would have to be treated as suggested above. Bituminous materials and asphalt are said to mix with liquid gas and be difficult to decontaminate. The question does not, however, appear to be a vital one, because if the contaminated area was near windows or doors to living accommodation, the whole of the contaminated material (of whatever kind) would have to be removed, and if not it could be allowed to evaporate.

SECTION IV.
PROTECTIVE ACCOMMODATION.

In the following notes consideration is given to all the types of Shelters at present being considered for the protection of persons, although experience in Spain indicates that the lesser types do not give adequate protection against modern weapons.

212. The assumption on which air raid precautions in normal buildings are based are relatively simple. Basically they are:—

(*a*) That no normal construction can completely resist direct hits with high explosive bombs.

(*b*) That every variation which strengthens the structure, even to a small extent, is of some value, because it makes the building more resistant to the effects of high explosive.

The basis of design for protective accommodation for persons must be entirely different, and it is a much more difficult problem for the architect or engineer, or whoever is responsible for the design of the structure.

Terms.—213. In the absence of certain knowledge of the penetrative and explosive capacities of the bombs which will be used against the structure, and in the absence of certain knowledge of the size and number which will be used, there is no clearly defined basis for structural design, and there can be no such thing as complete protection, 100 per cent. protection, or bomb-proof construction. The loose use of these terms can be extremely dangerous in that it is likely at least to confuse the technical man and certainly to deceive the layman.

"Bomb-proof."—214. There is no such thing as a "bomb-proof" refuge—*i.e.*, a refuge which can be *proved* to be wholly resistant to the penetrative and explosive capacity of every kind and size of bomb.

215. It can be (and often is) said that "they" won't use heavy bombs designed for high penetration because they are too expensive. It is extremely difficult to believe that any enemy would continue to use light bombs because they were economical to make if they had already been proved to be ineffective.

The Level of Protection. — 216. The forces which a refuge should resist are not then clearly defined, and whatever level of protection is decided upon it must be arbitrarily determined. This lack of a

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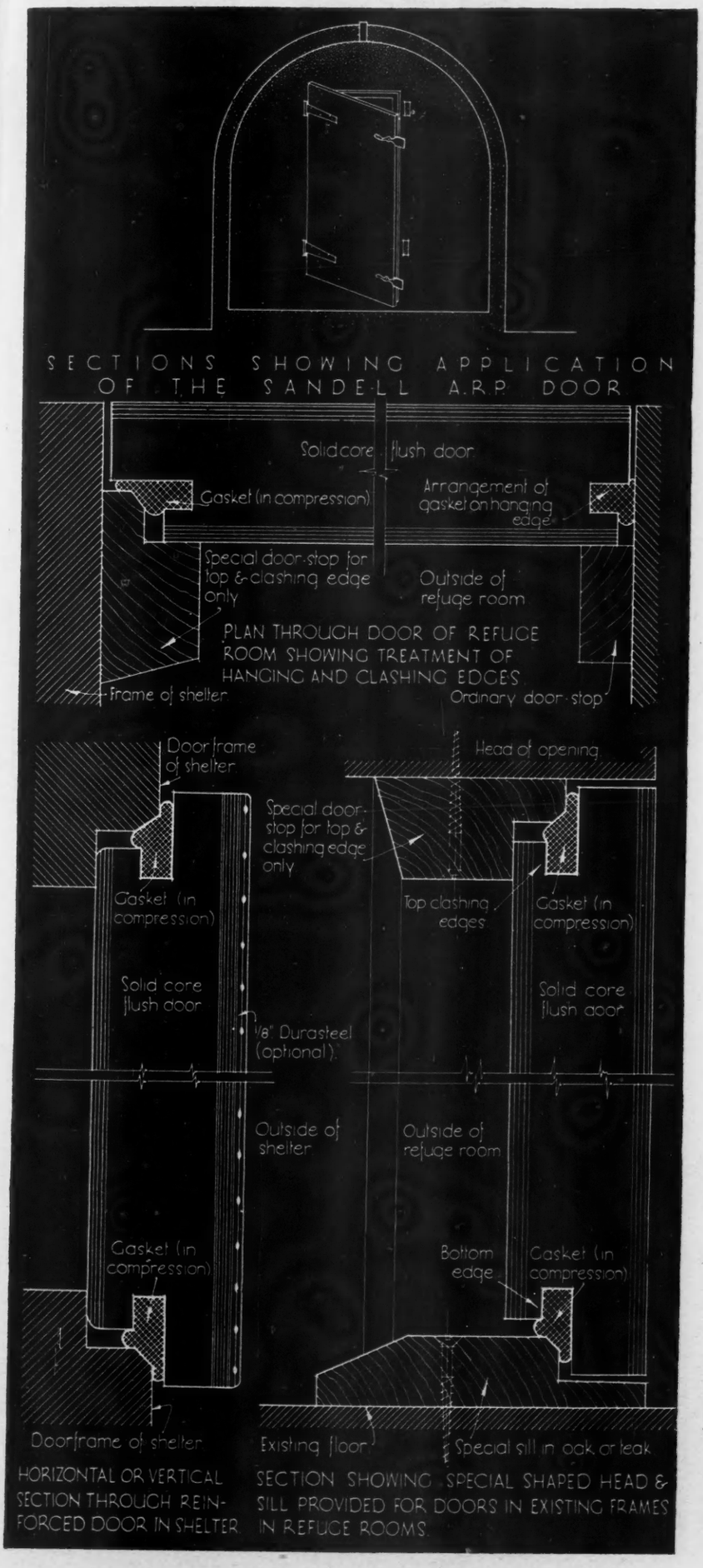
SECTIONS SHOWING APPLICATION OF THE SANDELL A.R.P. DOOR
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Arrangement of gasket on hanging edge
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Outside of refuge room
PLAN THROUGH DOOR OF REFUGE ROOM SHOWING TREATMENT OF HANGING AND CLASHING EDGES
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Ordinary door-stop
Door frame of shelter
Head of opening
Special door-stop for top & clashing edge only
Gasket (in compression)
Top clashing edges
Gasket (in compression)
Solid core flush door
Solid core flush door
1/8" Durasteel (optional)
Outside of shelter
Outside of refuge room
Gasket (in compression)
Bottom edge
Gasket (in compression)
Doorframe of shelter
Existing floor
Special sill in oak or teak
HORIZONTAL OR VERTICAL SECTION THROUGH REINFORCED DOOR IN SHELTER
SECTION SHOWING SPECIAL SHAPED HEAD & SILL PROVIDED FOR DOORS IN EXISTING FRAMES IN REFUGE ROOMS

PRO. PAT. No. 11344/38

SPECIFICATION

Core. Solid (to L.C.C. fire-resisting requirements) or framework.

Face. Alder, Beech, Oak, or other woods as required.

Edge. Section as detail below, rebated for gasket.

Gasket. Continuous band of $\frac{3}{8}$" x 1" Dunlopillo, covered with gasproof rubberised linen or with $\frac{1}{16}$" solid rubber.

Fastenings. Heavy refrigerator type, or mortice bolts.

Cill and Stops. Special sections provided if door is to be used in existing wood frame.

Extras. Thermite-proof panel or steel-sheet fitted to face. Gas-proof observation panel of double reinforced glass bedded in rubber.

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technical basis for the design of refuges is vitally important for architects and engineers, because it throws upon them a moral responsibility which in normal work they are not required to shoulder.

One or More Standards?—217. Refuge accommodation to be provided by private building owners for themselves or for associated persons is, and must remain, the responsibility of the building owners' technical advisers, the architect and the engineer. If one standard of protection were to be adopted for use throughout the country then no question of suitability for particular conditions or locality would arise. Unfortunately, it seems unlikely that one standard will be adopted. In its absence it is essential that the position should be stabilised to some extent by adopting more than one. It is obvious that this standardisation would be undertaken best by the architectural and engineering professions.

218. The two questions of standards of protective construction and standards of protection required must be examined together by the technical professions, not as political questions, but as technical subjects requiring classification to allow architects and engineers to carry out their work effectively.

The Present Position.—219. At the present time there are no standards but a few official recommendations and a host of individual suggestions, ideas and designs. Some few of these are summarised in the following pages, but little indication can be given of their relative value except on very broad lines.

SOME FACTORS RELATING TO THE DESIGN OF SHELTERS.

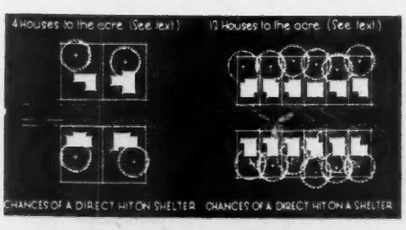
220. "Full protection." For the purposes of these notes the term "full protection" is intended to mean greater protection than is required to withstand the most destructive aerial weapon now known. In planning such protection the chances of a direct hit cannot be disregarded.

221. "Partial protection." Similarly, this term is intended to describe shelters which offer partial protection against direct hits; those which will fully protect the occupants against direct hits from some but not all bombs.

222. "Blast and splinter protection." This term is intended to describe those shelters which offer some protection against blast and splinters but not against a direct hit of any kind (except perhaps the small incendiary bomb).

Direct Hits.—223. In considering the value of either partial protection or blast and splinter protection, the chances of the shelters receiving a direct hit forms the vital consideration.

The Chances of Direct Hits.—224. The chances of direct hits on shelters in any given area depend upon the total area of the shelters on plan, the area of the


4 Houses to the acre (See text)
12 Houses to the acre (See text)
CHANCES OF A DIRECT HIT ON SHELTER
CHANCES OF A DIRECT HIT ON A SHELTER

Diag. 48. Diag. 49.

zone attacked, and the intensity of the bombing. In a residential area with four houses to the acre, exclusive of roads, and assuming that any hit within a radius of 30 ft. of the centre of the shelter is effective as a direct hit, the shelters being of the covered trench type, the ratio of areas will be (Diag. 48):—

Area of one acre, plus section of road 50 ft. wide (see diagram), 51,930 sq. ft.

Four shelter zones 30 ft. radius, 11,304 sq. ft.

Ratio of shelter zone to total area, approximately 1 to 4.6.

Ratio of shelter zone to remaining area, approximately 1 to 3.6.

The corresponding figures for areas with 12 houses to the acre and one shelter per house would be approximately 1 to 1.6 and 1 to 0.64 (total area 55,660 sq. ft. 12 shelter zones, 33,912 sq. ft.) (Diag. 49).

If in this case fewer but larger shelters were used, the area ratios would be increased, but it should be noted that the chances of survival per person would not change. The radius of the effective zone of the bomb will, of course, vary with the type of construction of the shelter, the determining factor being its resistance to the shock wave transmitted by the earth.

225. The corresponding figures for shelters built above ground to the strength recommended by the authorities would be as follows:—

Four houses to the acre—

Total area as before, 51,930 sq. ft.

Four shelter zones 50 ft. radius, 31,800 sq. ft.

Ratio of shelter zone area to total area, approximately 1 to 1.6.

Ratio of shelter zone area to remaining area, approximately 1 to 0.7.

Twelve houses to the acre—

Twelve shelter zones 50 ft. radius, 95,400 sq. ft.

Ratio of shelter zone area to total area, approximately 1 to 0.58.

The area required for shelter zones is greater than the total area; the number of shelters can therefore be reduced or the zones made to overlap. A bomb falling where two zones overlap would destroy both shelters. The radius of 50 ft. taken in the examples above refers to the type of construction intended to resist blast and splinters from a 500-lb. bomb bursting 50 ft. away.

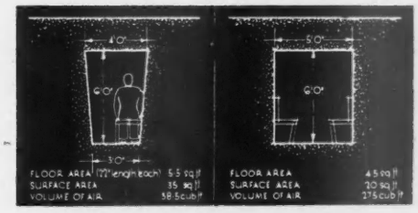
226. The size of the danger zone around the shelter is a vital factor in determining the likelihood of the shelter being destroyed, and the object of shelter construction should be to reduce the radius of the zone as much as possible. The figures above indicate, however, that the chances of shelters being destroyed are remarkably high in any area of medium or dense population. For this reason it is difficult to believe that blast- and splinter-proof shelters will provide adequate protection.

227. The figures for the surface shelters provided for each house in an area of 12 houses to the acre show that over the average every bomb dropped on the area will destroy one and four-fifths shelters. Since underground shelters are less vulnerable to shock than surface shelters are to blast and splinters (with comparable construction in each, the danger zone will be smaller for underground shelters than for surface shelters), the underground type is to be preferred, but both appear to be inadequate for any areas except those which are very sparsely populated.

Space per Person in Unventilated Shelters.—228. "An allowance per person of 75 sq. ft. of surface area (floor, ceiling and walls) is sufficient to enable unventilated protected accommodation to be occupied for periods up to a maximum of six hours. In districts likely to be subjected to special attack, an allowance of 100 sq. ft. per person should be made, thus providing for a stay of 12 hours" (15).

229. In a trench 3 ft. wide at the bottom (for a single row of seats) and 4 ft. wide at the top and 6 ft. high clear inside, the space figures per person are (Diag. 50).

Floor area (22 in. length each)	5.5 sq. ft.
Surface area	35 sq. ft.
Volume of air	38.5 cu. ft.



Diag. 50. Diag. 51.

230. In a trench 5 ft. wide (for a double row of seats) and 6 ft. high clear inside, the figures are (Diag. 51):—

Floor area	4.5 sq. ft.
Surface area	20 sq. ft.
Volume of air	27½ cu. ft.

231. A room 12 ft. by 8 ft. by 8 ft. 6 in. high has a total surface area of 532 sq. ft., which, according to the figures above, would be sufficient for seven persons for six hours or five persons for 12 hours.

The figures per person for the room above are, then, for seven persons:—

Surface area	76 sq. ft.
Floor area	13½ sq. ft.
Volume of air	116½ cu. ft.

and for five persons:—

Surface area	106 sq. ft.
Floor area	19 sq. ft.
Volume of air	163 cu. ft.

Surface Area. — 232. It would then seem that 75 sq. ft. of surface area should be taken as the minimum and the basis for all unventilated shelters, the plan and arrangement of occupants being designed to give maximum floor area and volume of air per person. The emphasis upon surface-area is due to the fact that comfort conditions for the occupants of an enclosed space depend, in practice, more upon temperature and humidity than upon air volume. The bodies and breathing of the occupants rapidly raise the temperature and the humidity of the air, and it is a "proved fact that a shelter having walls capable of absorbing moisture can be occupied comfortably for a longer period than a similar shelter having non-absorbent walls" (5). This phase of the question appears to need a good deal more clarification—to specify a minimum surface area without specifying, even approximately, the minimum absorbent value is hardly adequate.

233. The surface area in an unwaterproofed basement or trench system is unlikely to absorb any appreciable quantity of moisture; in most cases it will itself be saturated with ground moisture, and on the other hand such surfaces as the steel lining sections described and recommended by the Home Office (11) would not have any absorbent value at all, although they might cause moisture to condense.

It would perhaps be better to ignore wall, floor and ceiling surface areas, and to specify minimum areas of absorbent surfaces of particular values, to be provided by any suitable means, for example, by walls, wall linings, screens or hangings.

Floor Area and Air Volume. — 234. "For comfort and safety a minimum of 6 sq. ft. of floor area per person should normally be allowed. Under emergency conditions where overcrowding may occur, the allowance of floor space must never be reduced below 3½ sq. ft. per person" (11). An air input of 150 cu. ft. per hour per person is also recommended.

". . . The Home Office recommendations strike a very fair balance between economy of shelter space and conditions which may be regarded as tolerable."

"For shelters which are to be occupied for an indefinite period or for positions in which work has to be carried on, a more generous provision is necessary.

"The following Table indicates suitable allowances with the estimated final conditions:—

Period of Occupation.	Surface area square feet per occupant.	Ventilation c.ft. per hour per occupant.	Final conditions.	
			Temperature.	Relative Humidity.
Three hours	75	nil	88 deg. F.	100 per cent.
Indefinite	100	nil	83 deg. F.	100 per cent.
Three hours	30	450	81 deg. F.	72 per cent.
	40	150	85 deg. F.	100 per cent.
Indefinite	50	450	79 deg. F.	71 per cent.

"With outside temperatures of more than 70 deg. Fahr. the internal temperatures would be correspondingly increased. . . ." (16).

Ventilation. — 235. The floor area, surface area and air volume may be reduced considerably if the shelter is provided with a mechanical ventilation system. Such systems must be provided with gas filters, must have alternative intakes, each well protected from damage by blast and splinters, and must be of the forced intake type (not extract), so that a positive pressure is maintained within the shelter. Extract systems necessarily depend upon a slight negative air pressure within the shelter which would tend to draw gas in.

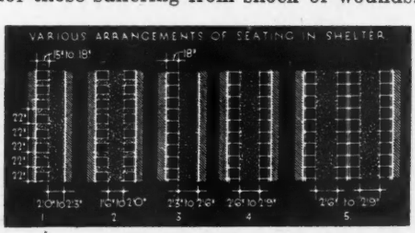
Accommodation.—236. The accommodation which should be provided varies with the number of the occupants and the degree of permanence of occupation and to some extent upon the degree of "luxury" intended. The simplest trench types for few persons are no more than covered trenches with gas curtains over each exit. Better equipped trenches and shelters should have lavatories if more than five persons are accommodated, and gas locks with double-doors or curtains at each entrance.

Shelters accommodating a number of persons should have space for a decontaminating department with dressing-rooms, etc., as outlined below. A fully equipped shelter for a number of persons should also have space and equipment for first-aid treatment.

Size of Shelters.—237. "It is better to have a number of small shelters than to attempt to congregate a large number of people in one shelter . . . 50 persons per shelter, or per compartment of a shelter, should be regarded as the maximum number in normal circumstances. . . ." (11). This limiting figure of 50 persons (which is now generally accepted) is, of course, arbitrarily fixed and is based upon the idea that 50 is a "reasonable" number of casualties should a shelter be hit. It should be appreciated that a reduction in the number and an increase in the size of the shelter in any given area reduces the chances of a shelter being hit, but increases the casualties when one is hit. The chances of escape *per individual* are not affected unless the plan-area of the vulnerable parts of the shelter is increased or decreased.

Seating or Other Accommodation.—238. Seating should be provided for all occupants of a shelter. The space per seat varies according to the arrangement of seating, as shown in the following diagram. It is usual to allow 18 in. per person (hip to hip), and 22 in. from back of seat to back of seat where seats are one behind the other. (Diag. 52.)

A.R.P. Handbook No. 6 gives 1 ft. 6 in. for the seat, and 2 ft. for gangway and footspace where seating is in a single row facing the gangway. This handbook also suggests bunks of 6 ft. 6 in. by 2 ft. clear inside dimensions; some bunks should be provided in all large shelters for those suffering from shock or wounds.



Diag. 52.

Entrances and Exits.—239. It has been shown in Spain that practically all people have an instinctive dislike of culs-de-sac in shelter accommodation, and that culs-de-sac tend to remain unoccupied even when the remainder of the accommodation is overcrowded. Alternative exits should therefore be provided in all cases.

In large shelters more than two entrances will be required for speed of access, but in addition the interior of the shelter should be planned so that every part has alternative means of escape. Emergency exits in the form of gas-proof and blast-proof manholes may be provided in addition to the entrances. They are, however, difficult to make blast-proof, or to arrange in protected positions, and are therefore liable to form weak spots in the protection.

Entrances must be ample to allow of rapid access to be obtained by the full number of persons. The time available between the warning of an attack and the arrival of the attackers may be very short, and there is likely to be a rush (amply justified) for shelter. Entrances should be so arranged that they are unlikely to receive the full force of near-by explosions.

Lavatories. — 240. Sanitary accommodation should be provided if possible even in small shelters, and it is essential where accommodation is provided for more than five occupants. Generally at least one w.c. or chemical closet should be provided for every 20 to 25 persons. If a large proportion of the occupants are likely to be males, then the number of closets may be slightly reduced and a proportion of urinals added. The Home Office recommends that the access distances should be not greater than 50 yds.

In many cases water closets will be impracticable owing to the level of the sewers, and in such cases chemical closets or other proprietary fittings should be used. They are to be preferred in any case, because it is undesirable to have any service pipes entering the walls of the structure, and so providing weak spots in the protection and possible means of flooding.

Decontamination. — 241. Since persons are liable to become contaminated by persistent gases, provision must be made for decontamination at the entrance to all shelters. In small shelters it is probably sufficient to provide a foot "bath" and a lavatory basin, preferably with space for undressing. In larger shelters, full provision must be made, including foot "baths," undressing-room, shower room and dressing-room. The floors and walls of approaches and of decontamination departments must be finished in impervious materials which can be readily washed down.

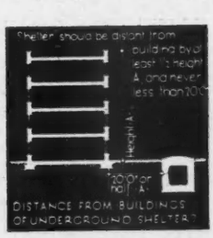
First Aid. — 242. All large shelters should be provided with some space for simple first-aid work, with adequate racks for equipment and space for stretchers.

Services. — 243. Every precaution must be taken to prevent secondary dangers arising in the case of a direct hit or a near hit, and for this reason electric lighting, if run from the main service, should have an emergency generating plant; gas should not be laid to shelters; water, if laid on, should be run to a storage tank so that in the event of pipes bursting the quantity of water will not be sufficient to cause serious flooding; pipes (sewerage or drainage, etc.) should not be run through the walls of the shelter, particularly in underground shelters where they might allow serious flooding to take place in the event of water mains being damaged; and equipment, if electrically driven, should have an emergency generator and be capable of manual operation.

Damp-proofing and Drainage.—244. The simpler types of trench in normally dry ground need not necessarily be waterproofed, even if they are of a permanent kind built in solid materials. In many cases it will be sufficient to provide drainage channels and a sump or sumps each fitted with a hand pump or a power pump capable of manual operation.

Deep shelters, those in wet ground and all large shelters should be thoroughly waterproofed and tanked, but even with these provisions drainage channels, sumps and pumps should be provided in case they are required for condensation, free water, surface water, or in the event of the waterproofing material being damaged by a near explosion.

Siting.—245. External above-ground or surface shelters should be placed as far as possible (subject to convenient and


Shelter should be distant from building by at least ½ height A and never less than 10'
A
DISTANCE FROM BUILDINGS OF UNDERGROUND SHELTER

Diag. 53.

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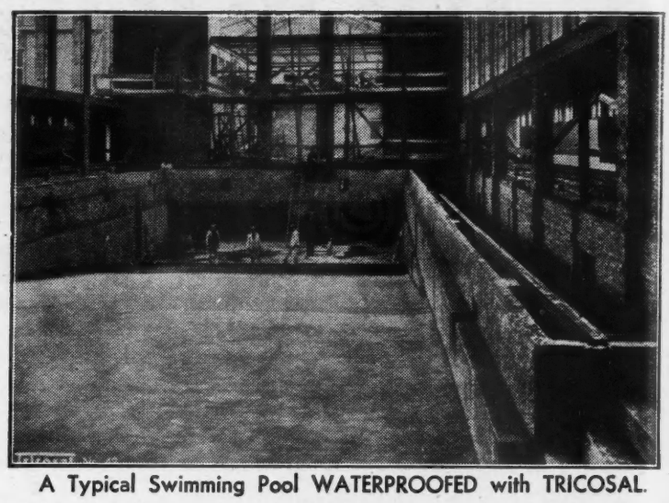

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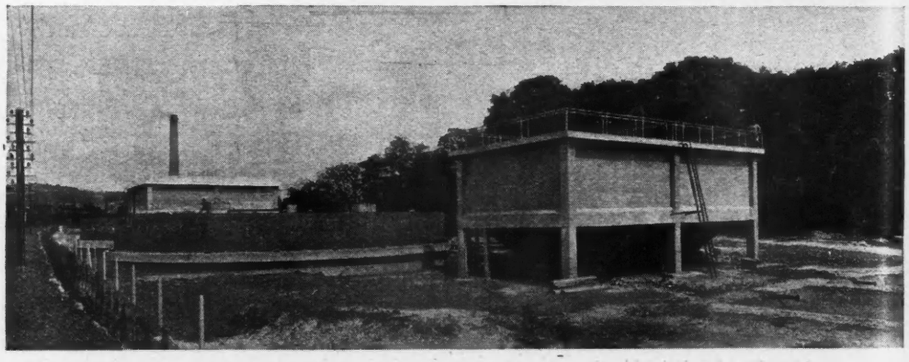

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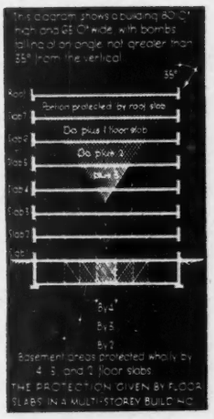
rapid access) from adjoining buildings, and wherever possible at least 20 ft. away. If the adjoining buildings are more than three storeys high the distance away should be equal to at least half the height of the building. Shelters constructed in or under existing buildings require special measures which are separately considered below (Diag. 53).

BLAST-RESISTING SHELTERS IN OR UNDER BUILDINGS.

246. The most obvious advantages of placing shelters within buildings are that they are then readily accessible to the occupants of the building, and that the services already in the building (light, power, water, sewerage, etc.) may be made use of. At first sight it would appear that the building above would offer some additional structural protection, but in fact it has been shown that many types of building offer no effective additional protection, but that they do increase the dangers to the shelter.

In other types, such as steel-framed buildings, the structure is of a kind which can offer some additional protection without increasing the dangers, yet, owing to the angle of approach of bombs, it is difficult to take full advantage of the structure (Diag. 54).


This diagram shows a building 60 ft. high and 45 ft. wide, with bombs falling at an angle not greater than 35° from the vertical
35°
Roof
Portion protected by roof slab
Floor 4
Floor 3
Floor 2
Floor 1
Ground floor
Basement
D4 plus 1 floor slab
D4 plus 2
D4 plus 3
"D4"
D3
D2
Basement areas protected wholly by 4, 3, and 2 floor slabs
THE PROTECTION GIVEN BY FLOOR SLABS IN A MULTI-STOREY BUILDING

Diag. 54.

Target Area.—247. The most important principle to be observed in designing and locating shelters of partial protection is that the target-area of the shelter and the danger zone around should be as small as possible, the danger zone being that zone within which a high explosive bomb will seriously damage the shelter. The size of this zone will, of course, be larger for the more destructive bombs and smaller for the less.

On Upper Floors. — 248. On this basis, shelters on upper floors of buildings do not compare favourably with underground ones, even of the covered trench type. An underground shelter is vulnerable to a direct hit on its own roof or within a relatively small surrounding zone (small owing to the lateral protection of the solid earth); a shelter on the upper floor of a building with load-bearing walls is vulnerable to a direct hit on its own roof or sides, or to any near hit which seriously damages any other part of the building which is supporting it, *e.g.*, a bomb bursting in the street (a considerable distance away from the shelter) may demolish part of the external wall, causing the collapse of floors and internal walls, with perhaps serious consequences to the shelter. In other words, the danger zone is very large; in framed buildings it may be smaller, but the shelter is far more vulnerable below and from the sides than a similar one in the ground.

249. A secondary but important consideration is the question of fire; the situation in a shelter on an upper floor could be extremely unpleasant if a serious fire developed on the same floor or below, and escape would be difficult unless extensive provision had been made.

Independent Underground Shelters.— 250. On the whole, unless other secondary dangers are present, such as liability to serious flooding, outside underground shelters are to be preferred to those located inside buildings. They might be provided in streets, backyards or surrounding open ground, and should be as near as possible to the buildings they are intended to serve, yet far enough away to be outside the area of falling debris. If they are connected to the building with underground access passages, they then have all the advantages of the shelter within the building without many of the disadvantages.

Weight of Debris. — 251. Shelters in existing buildings must be capable of withstanding the load and impact of falling debris and the collapse of the structure above. In fully framed buildings the roof of the shelter should be designed to carry 200 lb. per sq. ft., irrespective of the height of the building. In all other types of building the roof of the shelter should be designed to carry :—

200 lb. per sq. ft. if there are two storeys above.

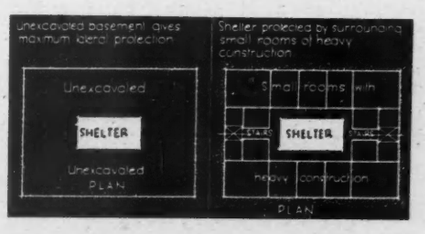
300 lb. per sq. ft. if there are three or four storeys above.

400 lb. per sq. ft. if there are more than four storeys above.

These figures are, of course, to be taken in addition to the self-weight of the roof of the shelter.

Basement Shelters. — 252. In spite of the obvious difficulties in providing safe shelters in cellars or basements, most authorities agree that they are to be preferred in this position rather than on ground level or on upper floors. Basement and cellar shelters take advantage of the natural lateral protection offered by the surrounding earth, and they *may* derive some benefit from the resistance to penetration of the building above.

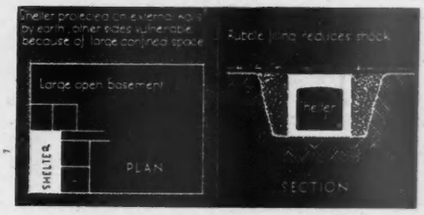
Position on Plan. — 253. Since the best lateral protection is surrounding earth, basement shelters are best planned so that they occupy the central area under the building with the remainder left unexcavated except for entrance and exit passages. If the remainder of the basement is excavated but occupied by many



Diag. 55. Diag. 56.

small rooms with heavy walls (*e.g.*, numerous strong rooms), then the cellular structure formed will offer reasonable lateral protection to the shelter (Diags. 55 and 56).

It is very doubtful, however, whether shelters should be in the central area if the remainder of the basement is excavated and unsubdivided, or subdivided only into large areas, or with light construction. Under these conditions the shelter is surrounded by a confined area which not only offers no protection (other than the resistance to penetration of the floors above), but actually increases the devastating effect of an explosion occurring within it. In such cases it is probably better to locate the shelter in a corridor formed by two external walls (or in a separate wing) so that it has at least two sides protected by solid



Diag. 57. Diag. 58.(See para. 266)

earth. The remaining sides can be given extra protection by using heavier walls or by planning adjacent "blanketing" rooms with heavy wall construction (Diag. 57).

Semi-basement Shelters. — 254. The upper parts of the walls of shelters in semi-basements may be regarded in the same way as walls of ground-floor shelters and built to the same strength, provided they are not surrounded by a sunken area. Those that are surrounded by a sunken area are more vulnerable to the effects of near explosion, since if the explosion occurs within the area it will be confined and its blast effect on the walls of the shelter will be greater. This factor may be ignored if the shelter is intended only to be blast-proof, offering protection only against bombs falling at a distance. If anything approaching full protection is intended, then the wall facing the area must be further strengthened.

Ground-floor Shelters. — 255. Ground-floor shelters will not usually be considered in buildings (new or existing) which are of many storeys or have basements. They are probably more vulnerable there than in any other position.

Vulnerable Position.—256. The ground storey of a building is liable to receive the maximum blast produced by a percussion bomb exploding on impact, a very great part of the blast from a delayed action bomb bursting outside the building, and the horizontal or upward (or both) blast from a direct hit by a delayed action bomb. The only occasion when reasonable protection could be obtained without very abnormal construction would be in a wide building with frame construction, in which the shelter could be planned in the central area and would be protected to some extent by normal walls of the building, and the floors above. It would, however, be liable to receive increased blast effect if a delayed action bomb were to burst within the building, particularly if the external and other walls were of heavy construction.

In Small Buildings. — 257. In small buildings of one or two storeys and in the ordinary domestic house, rarely built with any kind of frame construction and relatively few having any cellar or basement, the problem of satisfactorily locating a shelter is so difficult as to be almost impossible. If a good cellar or basement is available the factors affecting basements generally apply. If, however, a basement is not available, the

shelters must be provided on the ground floor or not inside the building at all. It cannot be emphasised too much that the ground-floor position in such buildings is even more unsatisfactory than it is in larger buildings.

258. A shelter on the ground floor of a small unframed building is probably in the most vulnerable position which can be found. It is subject to the impact and load of the collapse of the building; it derives little, if any, protection from the structure; it is at that level which is most liable to receive the full blast of a percussion bomb, and a great part of that from a delayed action bomb.

259. Nevertheless, ground-floor shelters are accepted by many as being adequate if better provision is not available. A.R.P. Handbook No. 6 (11) states that the walls of refuge rooms should be of the thicknesses required to prevent splinter penetration from a 500-lb. bomb bursting 50 ft. away—that is, 13½ in. brickwork or its equivalent. In view of the likelihood of shelters being hit in considerable numbers in areas of medium or congested population, this level of "protection" appears to be inadequate. On the information at present available, it is difficult to compare the protective value of a shelter with 13½ in. walls above ground with an underground shelter or a well-constructed covered trench, but other things being equal an underground shelter must necessarily be less exposed to blast and splinters and to that extent is to be preferred.

Upper-floor Shelters. — 260. It has been suggested, particularly by the Committee of the Institution of Structural Engineers (8) that in many cases shelters would be better placed in the central part of a building or on an upper floor. It is suggested that about third-floor level would be a suitable level for a shelter in six- or seven-storey buildings, because:—

(*a*) "It would be above the level of gas.

(*b*) "The weight of falling material above this level would be less than that above the basement.

(*c*) "There would be considerable protection against blast and splinters . . . (the worst splinters are generally those which travel horizontally along the ground, which would not reach the third floor, and blast pressure at third-floor level is likely to be less than at ground-floor level).

(*d*) "Even against high-explosive bombs the third-floor position may be quite as good as the basement, since bombs of the percussion type might explode on the roof and not necessarily kill people as far down as the third floor, while those of the delayed action type might penetrate through comparatively small holes in the upper floors and explode in the basement, and still afford a possibility of people on the third floor remaining alive afterwards" (8).

261. Since buildings with load-bearing walls are now generally accepted as being exceptionally vulnerable to secondary damage and collapse owing to direct or near hits, the upper floors of such buildings would be quite unsuitable for shelters. Shelters on the upper floors would be less dangerous in framed buildings but even in framed buildings there are very serious objections to them.

Flooding. — 262. Every precaution must be taken to eliminate or, at least reduce, the possibility of flooding in the event of neighbouring water mains, tanks or boilers being burst. Wherever possible existing pipes should be directed so that they do not run through the shelter walls, and no new pipes should be allowed to penetrate them. Entrances should be carried up a little above ground-level and a curb provided to prevent surface water finding its way in.

Entrances.—263. The entrances and exits are particularly liable to be blocked with fallen debris, and for this reason should be located in positions where the construction above is particularly strong and preferably framed. If possible the approaches to the shelter entrances and exits (passage, corridors, etc.), should be strengthened to resist falling debris. In some cases it may be possible to arrange for the exits to discharge into the open by way of tunnels, and this is probably the safest arrangement provided the mouths of the tunnels are well constructed and not likely to be buried by falling debris.

Accommodation, Services, etc.—264. The requirements for shelters in buildings are, of course, the same as for any other shelters as already outlined, except that in some cases the existing services in the building may be used in conjunction with the shelter (*e.g.*, lavatory accommodation).

Roofs or Ceilings. — 265. A.R.P. Handbook No. 6 recommends that shelters in buildings should have a ceiling of 5 in. of solid concrete reinforced, and elsewhere it is recommended that in multi-storey buildings the ceiling should be additionally heavy and capable of carrying 200, 300, or 400 lb. per sq. ft. according to the number of storeys above to allow for the weight of falling debris. The 5-in. concrete ceiling is, of course, comparable in its efficiency, or lack of it, with the 13½ in. shelter walls. Both will be considered by many to be inadequate.

Walls. — 266. Although it is recommended that blast- and splinter-resisting shelters need only resist the effects of a 500-lb. bomb bursting 50 ft. away (the 13½-in brick wall or its equivalent), in all shelters the heavier the walls and the more thoroughly they are reinforced the better. The walls of basement shelters, where they are closely surrounded by solid earth, would be protected to some extent against shock if a loose rubble filling were provided between the solid earth and the wall, and left open at the top. This loose filling is said to provide a cushion and an escape for the gases of a near explosion (Diag. 58, page xxi).

SHELTERS IN NEW BUILDINGS.

267. The provision of shelters in new buildings raises no problems unusual to A.R.P. work. The foregoing notes have summarised most of the basic factors which will affect planning and construction. In new buildings there is nothing (except cost) to prevent shelters being built with any required degree of protection up to the level at which they may be termed shelters of full protection.

SHELTERS IN EXISTING BUILDINGS.

268. Generally, it will be found that within the limits of space and headroom shelters can be built satisfactorily into existing framed structures, but that in buildings of all other types the difficulties and cost of providing adequate protection against both explosion and falling debris are so great that in nearly every case other locations will be preferred.

Walls and Ceilings.—269. Where existing walls are inadequate they may be thickened, buttressed or lined as required to bring them up to the proposed level of protection. The ceiling of the shelter usually presents far greater difficulties owing to limitations of headroom, the weight of the new construction and the difficulties of execution. Generally, a combination of additional supports or shoring and strengthening of the ceiling itself will be used. With timber floors, heavy floorings and fireproof upper and lower linings are advisable, with ample shoring or other support. Shoring, however, must be carefully designed if it is to withstand not only the heavy load which it is expected to carry, but also the impact of falling debris. Shoring would be extremely dangerous if the wedging (or other anchorage provided) failed with jarring of heavy impacts. Where heavy loadings must be provided for, owing to the number of storeys above, it will usually be more economical and much more satisfactory to remove the existing wood floor and provide an entirely new reinforced concrete slab of adequate thickness.

270. Reinforced concrete floors are extremely difficult to strengthen except by providing an extra and fully reinforced slab above. Obviously strutting, shoring or the provision of new supports to reinforced concrete beams or slabs must be placed with extreme care, since wrongly placed supports may so change the balance of tension and compression forces that the structure is weakened and not strengthened.

INDEPENDENT BLAST-RESISTING SHELTERS ABOVE GROUND.

271. It is recommended by the Home Office that roofs of independent shelters built above ground should be proof against direct hits from incendiary bombs up to 25 lb. in weight, and that the walls should resist the effects of a 500-lb. high-explosive bomb bursting 50 ft. away. That is, 13½-in. brickwork walls or its equivalent.

It is to be hoped that far heavier construction will be used wherever possible, but in any case underground shelters will be preferred wherever subsoil conditions permit their use.

Exterior Shape. — 272. A number of designs have been produced, and some shelters built in Spain with the exterior shaped in a way intended to increase the chances of a direct hit striking only a glancing blow on the structure. It was thought that the shaped sloping surfaces would tend to deflect the bomb and thus reduce penetration. It is very doubtful if any deflection would take place except in the case of the lighter types not designed for penetration, and since bombs seldom, if ever, drop vertically, it is probable that a sloping roof would have a greater chance of receiving a direct hit normal to its surface than would a flat roof.

Types of Construction. — 273. Independent shelters above ground may consist of massive masonry, brick, reinforced brickwork, mass or reinforced concrete, or they may be formed with a relatively light inner shell and depend for their protective value upon earth cover, or they may be formed of a combination of both methods. The lighter types of construction not intended to give protection against near hits need not have particularly strong floors, but the heavier types with great resistance to overhead and lateral forces should have floors strong enough to resist the upward blast and shock effects from delayed action bombs falling near by.

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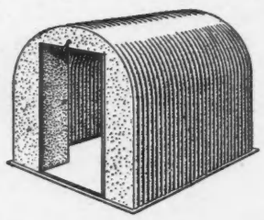

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274. Some of the light types of inner shell are:—

(*a*) Light brick or concrete walls and roof slabs built in normal rectangular shape.

(*b*) Precast concrete sections in straight lengths or in shaped sections to form a semi-circular, segmental or other shaped shell.

(*c*) Steel sections of similar shape interlocking, and depending on their own strength or intended to be carried on a steel framing.

(*d*) Cast-iron sections in similar shapes.

(*e*) Concrete pipes of large diameter.

The Government Shelter.—275. In addition to these general types, there are a number of patent designs in various materials suitable for use as independent shelters above ground, and there will be in the future the pressed steel "container" to be provided by the Government and described in the House of Commons by Sir John Anderson as follows:—

"A special type of steel shelter which is in sections and can be easily put together without any technical skill or professional assistance. To secure the maximum degree of protection, this shelter should be placed outside the house, close to the house wall—in a garden or yard—and should be sunk about 2 ft. in the ground, the displaced earth being piled up over the top of the steel frame" (4).

In reply to a question, Sir John Anderson stated that he could at present give no "indication of the radius of the area which would come within his definition of a direct hit."

In the absence of any further details it is impossible to assess the value of this shelter or its relation to those already available.

BLAST-RESISTING SHELTERS BELOW GROUND.

Types of Construction. — 276. This group includes all those shelters ranging from the temporary covered trench to the large multi-compartment permanent shelter and the garage-shelter, which are intended to be sunk into the ground so that the whole of the structure itself (but not necessarily the earth cover) is below general ground level.

The simplest type is probably the timber-lined trench described in detail in the Pamphlet on Garden Shelters issued by the Home Office.

Practically all the light shell structures mentioned above for above-ground shelters are suitable below ground, and, of course, they depend in the main for protective value upon the surrounding earth and earth cover. It is probable also that the new Government steel shelter will also be suitable for use below ground.

Strength. — 277. Obviously the stronger the walls and roof of the underground shelter the greater will be its resistance to earth shock and the smaller will be the danger zone around it. The heaviest forms of shelter are therefore to be preferred; they may be in concrete, reinforced concrete, brick, reinforced brick or any masonry or precast block construction. The floors need not necessarily be of equal strength to the walls but they should be of considerable strength to serve as a continuous buttress to prevent inward movement of the external walls due to earth shock.

Roofs.—278. The roof should be as heavy as possible and should, like the floor, be designed to serve as a buttress to the external walls. The shelter should be surrounded with a layer of loose rubble packed between the solid earth and the external walls to provide a "cushion" against earth shock.

Waterproofing.—279. The whole structure should if possible be tanked, but in dry localities it would be possible to omit the waterproofing and depend on occasional pumping from the drainage sumps.

Roof Protection. — 280. Generally, it can be assumed that the greater the protection obtained above the better, and concrete is about 2½ times more resistant to penetration than well-consolidated earth; 6 in. of concrete plus 5 ft. of earth cover is therefore about equal in value to 2 ft. 6 in. of solid concrete. Various sandwich or double-sandwich arrangements have been suggested, using two or more slabs of concrete with earth filling in between. The exact value of these devices has not yet been proved conclusively, but while they appear to offer increased resistance for the amount of material used, there is the considerable danger that a bomb which penetrated the first slab would, owing to the confining effect of the sandwich, do more damage than would have occurred with a simpler arrangement.

281. Independent shelters below ground are the most satisfactory and efficient form other than those offering full protection, and are to be recommended for use wherever possible if full protection cannot be provided.

SHELTERS GIVING FULL PROTECTION.

282. The elements of full protection are simple enough within the limits of the known destructive forces. Either earth cover is depended upon for protection and the shelters are put at great depth below the ground-level (50 ft. to 70 ft.), or the structure itself is designed to resist penetration and explosion, requiring enormous masses of solid construction (usually concrete), or a combination of these two is used, the protection being obtained from both earth cover and massive construction.

Tunnels. — 283. The enormous cost of excavation and heavy construction has led a number of investigators to consider underground tunnels in detail, and it appears from their work that not only are they eminently practicable but they are also likely to be more economical than the alternatives.

In spite of the fact that tunnels will probably in the long run provide the solution to the problem of giving full protection, it is not proposed to deal with them here in any detail. Tunnel shelters form a separate section of A.R.P. work which lies more within the fields of the civil engineer and the mining engineer than those of the architect and builder.

284. It is, however, important that all concerned with A.R.P. work should appreciate that deep tunnels are likely to prove satisfactory and more economical than other more massive constructions, and it may frequently fall to an architect to recommend that tunnels should be investigated before other more costly means are considered for providing full protection.

285. The two most obvious problems are the danger of flooding and the difficulty of access. Neither is, however, insoluble. The question of flooding is a technical engineering problem, and that of access is one of planning and protection. Ramps are considered unsuitable and stairs in long flights occupy a great deal of space and become progressively more vulnerable and expensive to protect as they near the ground-level. It should not, however, be impossible to design stair "towers" in the ground with solid "wells" which would offer relatively small target areas, and would not be difficult to provide with partial protection at the top and which would get progressively less vulnerable as they went down, each flight adding to the protection of the flight above. Damp-proofing and ventilating problems would be on a larger scale than in smaller surface shelters, but again they would not be insoluble.

286. Full protection in buildings above ground or in the ground but depending only upon the resistance of the roof structure is costly and extravagant in material and labour. Such buildings must be designed more as fortifications than as A.R.P. structures. Some few have been built in Spain and described (at least in this country) as "bomb-proof," but it is not at all certain that they would comply with the definition of full protection given above. Next to tunnels, full protection can be most reasonably obtained by using both earth cover and heavy construction.

Earth Cover and Concrete. — 287. If 60 ft. of earth is taken as giving full protection, then 15 ft. of concrete plus 22½ ft. of earth would give approximately equal protection. If the earth cover is reduced and the construction increased, care must be taken with the floor of the shelter. If maximum depth of penetration for large bombs is lower than the floor of the shelter, then the floor must be of a strength equal to the walls, otherwise the upward blast and shock from a near-by explosion may wreck the shelter.

288. As has already been mentioned in connection with shelters of partial protection, various suggestions have been made that the top cover should be formed of alternate layers of earth or other filling and concrete. Such devices must be examined with caution until some data are available, because it is possible that such layers would do more harm than good, owing to the confining effect of the upper slabs on the explosion of a bomb which had penetrated some distance into the "sandwich."

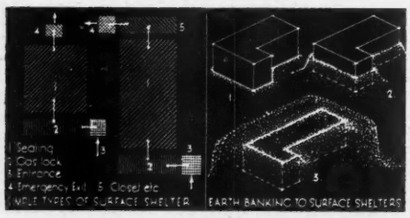
Care must also be taken with the reinforcement of all roof slabs, because of the known tendency for the underside of the slab to spall off in the event of a severe impact or explosion.

Generally, three-way reinforcement is recommended, with the lowest layer kept close to the underside of the concrete. It appears to be likely, however, that an entirely separate ceiling lining of sheet steel will be required to prevent spalled-off lumps falling on the occupants.

INDEPENDENT SURFACE SHELTERS.

Following are some types of independent surface shelters:—

289. A single surface shelter for up to four persons. Such shelters should have the usual gas lock with gas-proof door or curtain, and the external door should be gas-proof and as blast-resisting as possible. It would be advantageous in such shelters to enlarge the gas lock to accommodate a



Diag. 59. Diag. 60.

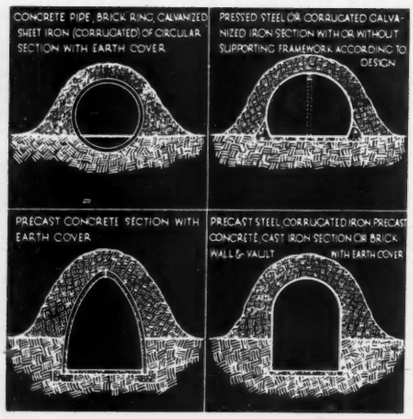
stretcher and a lavatory basin, and to provide a closet (Diag. 59).

290. A surface shelter for five or more persons. Note earth banking (Diag. 60).

The gas lock should be large enough to accommodate a stretcher, and should be equipped with a lavatory basin. Such shelters may with advantage be mechanically ventilated with a simple input system with filters.

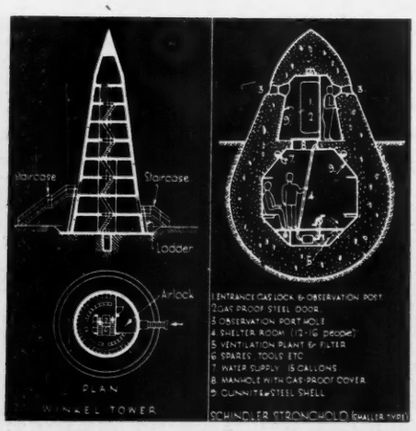
291. One of the surface shelters erected during 1937 in Valencia is shown by a photo. Such shelters accommodate from 250 to 1,250 persons, and are provided with sandwich roofs either domed or flat. The flat roof has steel and concrete protection in addition to a 2-in. concrete slab, two 3-in. layers of sand and a 5-ft. slab of concrete. The shelters are mechanically ventilated with electric power, and have emergency dynamo equipment.

292. A surface shelter constructed near London by Messrs. Trollope and Colls, and protected by earth cover. (Photos on page xxix).


CONCRETE PIPE, BRICK RING, GALVANIZED SHEET IRON (CORRUGATED) OF CIRCULAR SECTION WITH EARTH COVER
PRESSED STEEL OR CORRUGATED GALVANIZED IRON SECTION WITH OR WITHOUT SUPPORTING FRAMEWORK ACCORDING TO DESIGN
PRECAST CONCRETE SECTION WITH EARTH COVER
PRECAST STEEL, CORRUGATED IRON PRECAST CONCRETE, CAST IRON SECTION OR BRICK WALL & VAULT WITH EARTH COVER

Diags. 61 (top left), 62 (top right), 63 (lower left), and 64.

293. Various forms of surface shelter with inner "shell" and earth covering (Diags. 61, 62, 63 and 64).



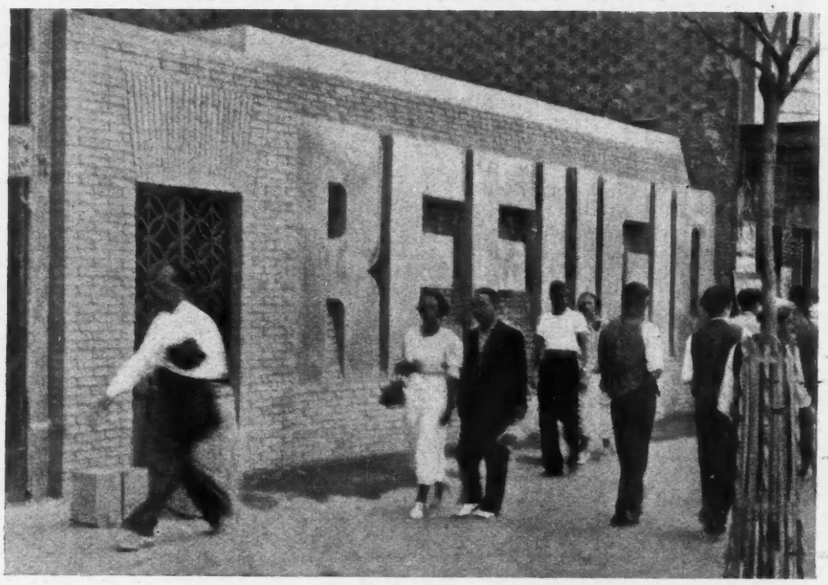
Diag. 65. Diag. 66.

294. The Winkel Tower, named after its German designer. "The conical shape, it is claimed, will deflect bombs and prevent penetration. For that reason the outer walls have only . . . to resist the effects of detonation, but have to be of constant thickness for the full height of the tower. It is also claimed that even heavy bombs exploding near or under the foot of the tower cannot imperil the stability of the structure. The Winkel Tower has been standardised . . . in four sizes, with a capacity of 400 people for the largest and 168 for the smallest" (17) (Diag. 65).

295. The Schindler (smaller) stronghold. "The cone above ground contains the entrance and air lock. . . . The sphere below ground encloses the actual shelter room. . . ." (17) (Diag. 66).

296. An air raid shelter in Valencia completed early in 1938: it accommodates 2,500 people. (Photo.)

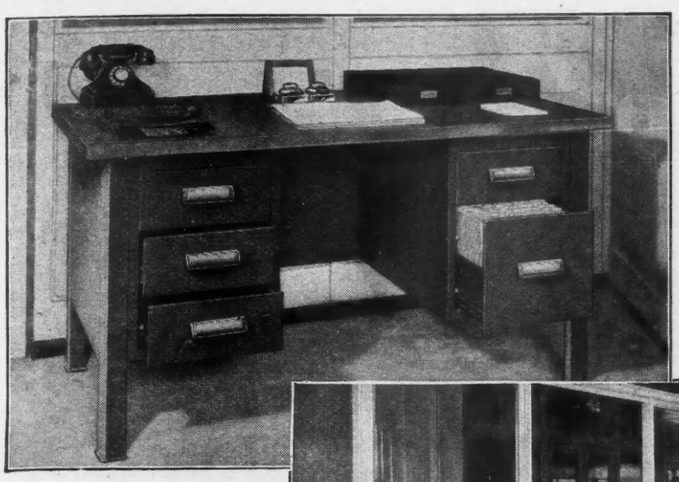
297. A protected observation post. An observation post erected at their Longbridge Works by the Austin Motor Co., Ltd. They are heavily constructed and sandbagged, and are intended to be splinter-proof. (Photo.)



A 1,250-CAPACITY "REFUGIO," VALENCIA. (See para. 291.)

AN AIR RAID SHELTER, VALENCIA. ACCOMMODATING 2,500. (See para. 296.)

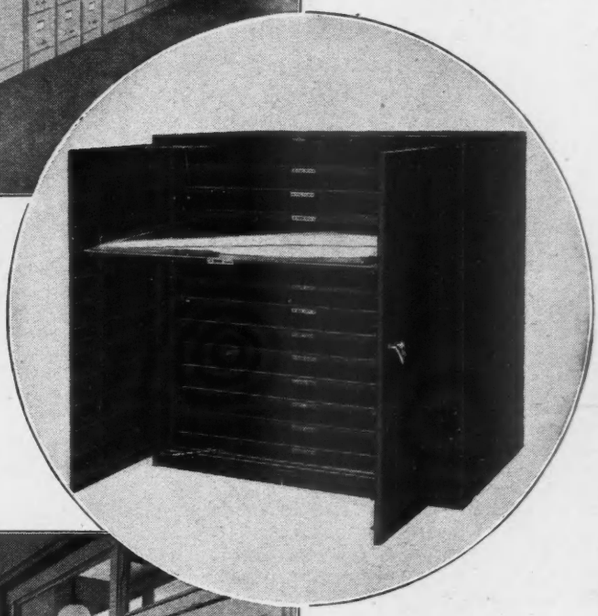
A PROTECTED OBSERVATION POST, LONGBRIDGE MOTOR WORKS. (See para. 297.)



STEEL DESKS *(Left)*

STEEL FILING CABINETS *(Right)*

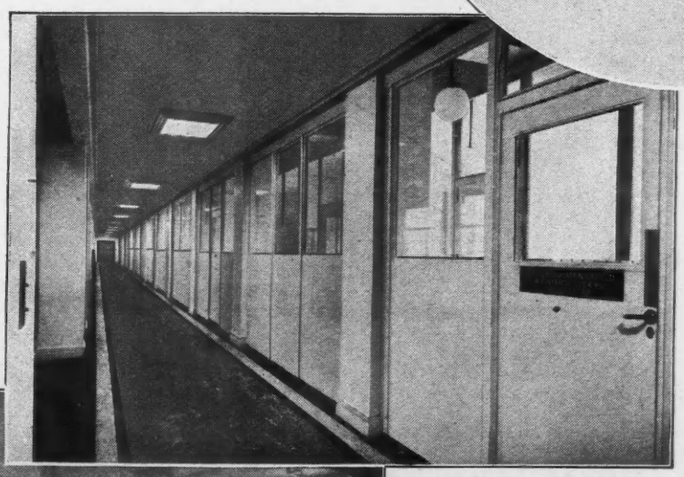
STEEL PLANFILES *(Below)*



AIR RAID PRECAUTIONS

"Nothing to burn" is the best form of protection from the effects of fire following bomb explosions. Roneo Steel Equipment will not burn in itself, and is constructed to provide protection against heat for the irreplaceable documents stored therein.

STEEL PARTITIONS AND DOORS *(Left)*



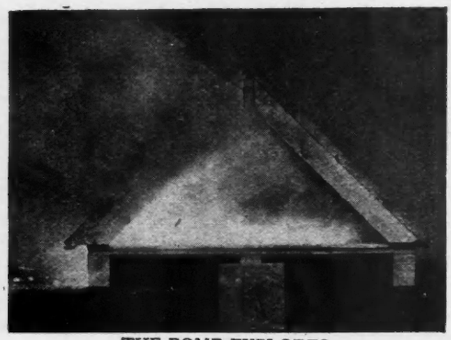
STEEL CLOTHES LOCKERS *(Below)*

STEEL

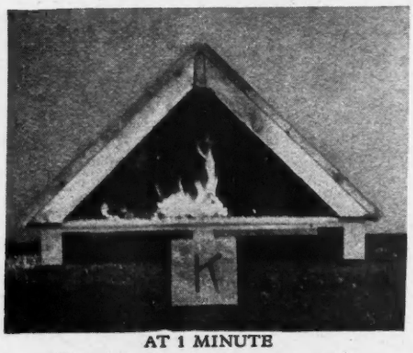
Roneo Equipment

17 SOUTHAMPTON ROW, LONDON W.C.1

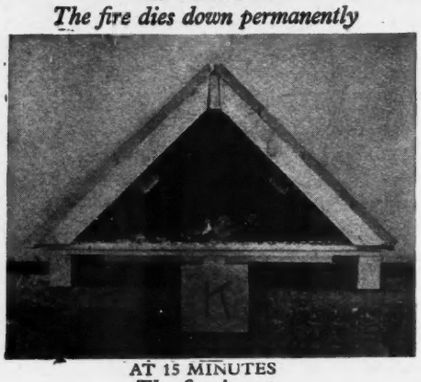
"PIONEER"
TRADE MARK



THE BOMB EXPLODES



AT 1 MINUTE
The fire dies down permanently



AT 15 MINUTES
The fire is out

FIRE-RESISTANT FINISH—A.R.P. GRADE

"Pioneer" Fire-Resistant Finish—A.R.P. Grade is a mineral plastic of special value for permanently protecting woodwork and combustible materials against the fire effects of Incendiary Bombs (I.B.) and against fire generally. Its temperature cannot rise much above 200° F. until the water in its chemical composition is driven off, so that initial decomposition of the protected wood, with the evolution of flammable vapours, is delayed. The dehydrated Fire-Resistant Finish possesses high thermal insulation as well as temperature resistance. Wooden models were made to reproduce in the simplest manner the edge and surface conditions encountered in the average domestic attic space with exposed boarding and roof timbers. An incendiary bomb about half the weight of standard 2 lb. I.B. was discharged and the models in which the wood was unprotected or treated with limewash were burned to destruction, whereas in others the use of "Pioneer" Fire-Resistant Finish led to extinction of fire as is shown in the photographs. Although the test was severe it is not suggested that extinction would occur in all practical forms of attack. Extinction should only be taken as a general indication of powerful retardation allowing time for the methods advised by H.M. Home Office for dealing with I.B. to be brought into play. "Pioneer" Fire-Resistant Finish —A.R.P. Grade—is supplied as a fine, light grey powder which is mixed with water and easily applied by brush or spray.

THE "PIONEER" BLOCK
TRADE MARK

FIRE-RESISTING QUALITIES

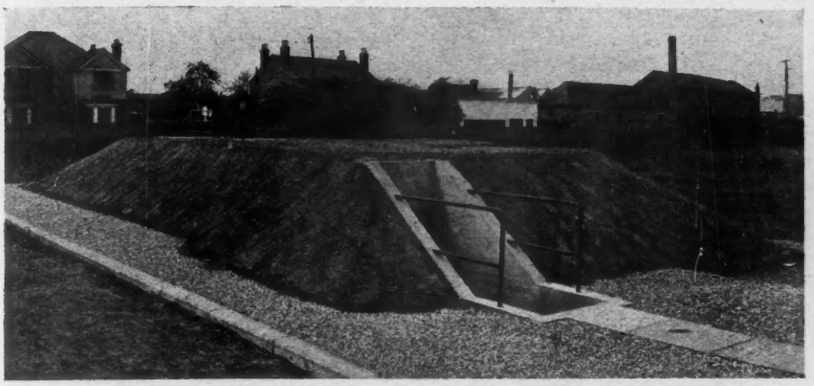
Where fire-resistance is to be a feature of design, the "Pioneer" Block is a most appropriate building material. It is entirely non-combustible and fire-resistant (that is, it prevents the spread of fire), and does not involve any complicated or unusual building methods. It is able to arrest the spread of fire because of the combined water of crystallisation which it contains to the extent of approximately 20% by weight. Until all this water has been driven off, it is impossible to raise the temperature of the block much above 200°F. The photograph shows the state of "PIONEER" partitions after a serious fire at the London offices of The Gramophone Co. Ltd. In sharp contrast to the collapsed false ceiling and the debris of the surrounding plastered stud partitions and woodwork, none of the "PIONEER" partitioning was found to have collapsed in spite of a fire temperature of over 1,800°F. judged from the melting of the wired-glass panes over the cubicles.

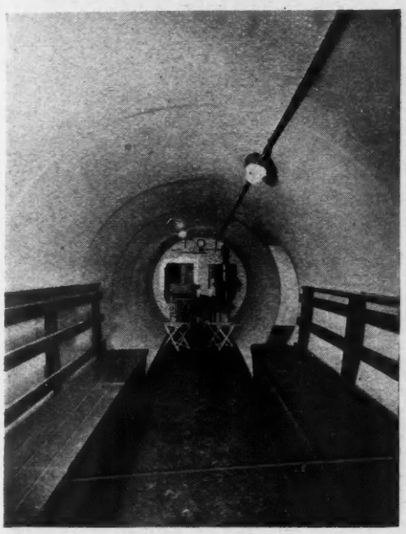
CASEBOURNE & CO. (1926) LTD.

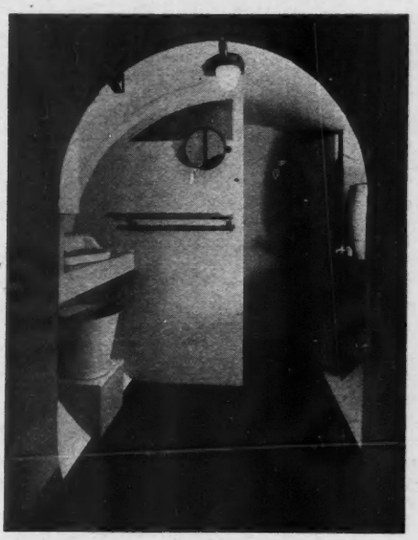
A subsidiary company of

IMPERIAL CHEMICAL INDUSTRIES LIMITED

DEPT. P.8, IMPERIAL CHEMICAL HOUSE, LONDON, S.W.1



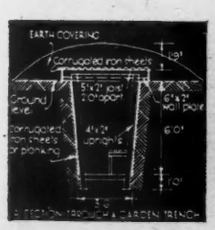




A SURFACE SHELTER NEAR LONDON. (See para. 292.)
1. Exterior, showing entrance. 2. Interior, showing seating accommodation. 3. Gas lock and inner entrance.

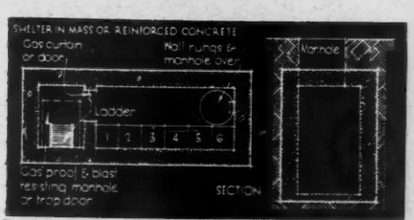
UNDERGROUND SHELTERS.

298. Wood-lined trenches. The diagram given here is based on the trench design recommended in the pamphlet on Garden Trenches issued by the Home Office (S.O. Code No. 34-301). The trench is lined with corrugated iron or boarding supported on timber framing; the shelter is equipped with a gas curtain and seating for six (Diag. 67).



Diag. 67.

299. A typical plan for a small trench shelter with solid construction and seating 4-6 persons (Diags. 68-69).

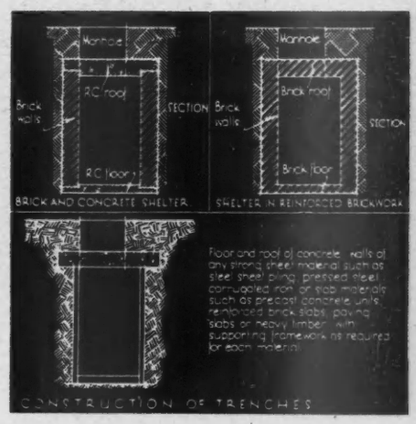

SHELTER IN MASS OR REINFORCED CONCRETE
Gas curtain or door
Wall rungs to manhole over
Manhole
Ladder
1 2 3 4 5 6
Gas proof & blast resisting manhole or trap door
SECTION

Diag. 68.

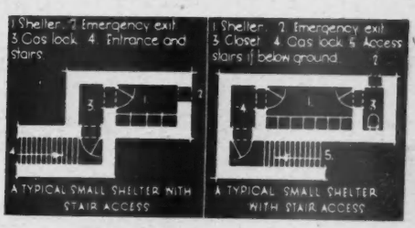
300. In addition to their uses for surface protection, a number of shelters of this type are also suitable for underground work with suitable provision for access (Diags. 70-73).

301. Typical plans of two small shelters with stair access. Such shelters may with advantage be enlarged so that the gas lock will accommodate a stretcher and a lavatory basin (Diags. 74 and 75).

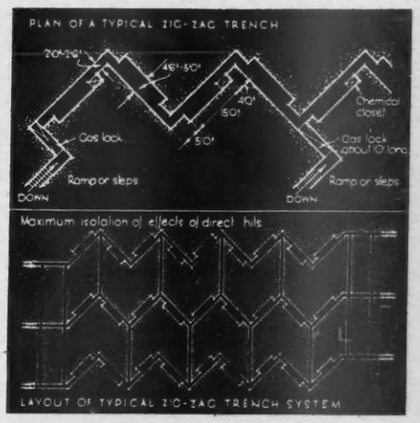
Diag. 73.


Manhole
RC roof
Brick walls
SECTION
RC floor
BRICK AND CONCRETE SHELTER
Brick roof
Brick floor
SHELTER IN REINFORCED BRICKWORK
Floor and roof of concrete walls of any strong sheet material such as steel sheet piling, pressed steel, corrugated iron or slab materials such as pre-cast concrete units, reinforced brick slabs, paving slabs or heavy timber with supporting framework as required for each material
CONSTRUCTION OF TRENCHES

Diags. 70 (top left), 71 (top right), and 72.


1 Shelter. 2 Emergency exit 3 Gas lock 4 Entrance and stairs
A TYPICAL SMALL SHELTER WITH STAIR ACCESS
1 Shelter. 2 Emergency exit 3 Closet 4 Gas lock 5 Access stairs if below ground
A TYPICAL SMALL SHELTER WITH STAIR ACCESS

Diag. 74. Diag. 75.



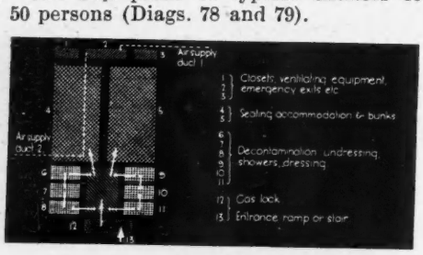
Diag .76 (top), and 77. (See page xxx.)

SHELTER TO ACCOMMODATE 4,000 PERSONS AT LONGBRIDGE MOTOR WORKS.
(See para. 308.)

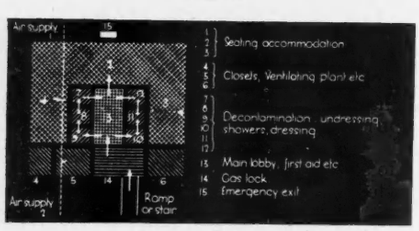
Trench Systems.—302. The main feature of laying out trench systems is that they should be designed to localise as far as possible the effects of a direct hit. They should, therefore, be zig-zagged, no straight length used for shelter purposes being greater than 16 ft. to 20 ft., and parallel systems should be not less than 20 ft. apart (Diags. 76 and 77. See p. xxix).

Larger Underground Shelters. — 303. Larger underground shelters must be divided up into sections, each section holding not more than 50 people, so that the death roll is reduced in the event of a direct hit. Ideally, the dividing walls should be at least as strong as the external walls. Such shelters should be provided with accommodation for decontaminating persons and clothing, bunks for the injured, and space for first-aid work.

304. Two plans of typical shelters for 50 persons (Diags. 78 and 79).

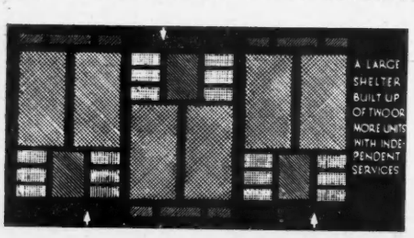


Diag. 78.

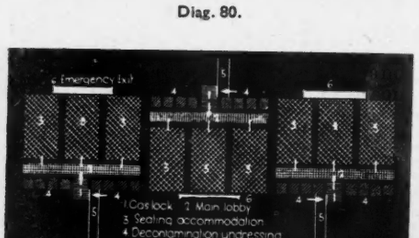


Diag. 79.

305. Larger shelters may be built up in units, each block having its own gas locks, showers, etc., or they may have these services centralised around the entrances;



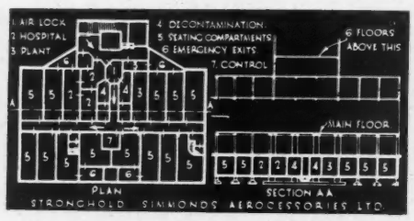
Diag. 80.



Diag. 81.

but it is essential that a number of entrances should be provided to allow rapid occupation (Diags. 80 and 81).

306. Plan and section (Diag. 82) show the shelter accommodation which has been provided under part of the factory buildings by Messrs. Simmonds Aerocessories, Ltd.; architects: Wallis, Gilbert and Partners; engineer: Mr. C. F. de Steiger. The external walls are 2 ft. 6 in. and 2 ft. 9 in. thick, the internal walls 1 ft. 6 in., and the roof 2 ft. 6 in. thick, all in vibrated concrete reinforced in three directions (Diag. 82).



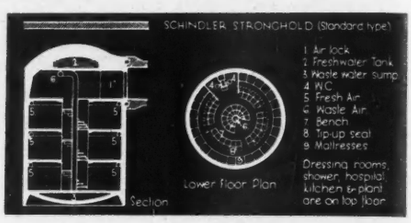
Diag. 82.

307. Shelters Giving Full Protection. As has already been mentioned, full protection can only be obtained with a great thickness of earth cover or very heavy construction, or a combination of both. Obtaining the most economical form is, broadly speaking, a matter balancing the cost of excavation against cost of construction.

308. A photograph on p. xxix shows a shelter under construction at the Longbridge works of the Austin Motor Co., Ltd. It is L-shaped on plan, accommodates 4,000 persons, and will be covered with 35 ft. of earth. The shelter is built upon the floor of an old sandpit. (Photo.)

309. The Schindler stronghold of standard type, described by C. F. de Steiger (17), derives its protection from a detonating slab, earth cover, and the strength of the circular structure (Diag. 83).

"Entrance to this stronghold is effected by tunnels, either from the open or from neighbouring buildings. The entrance floor contains a gas lock, decontamination facilities, and all plant necessary to make the stronghold independent of any outside supply."



Diag. 83.

SECTION V.
CAMOUFLAGE.

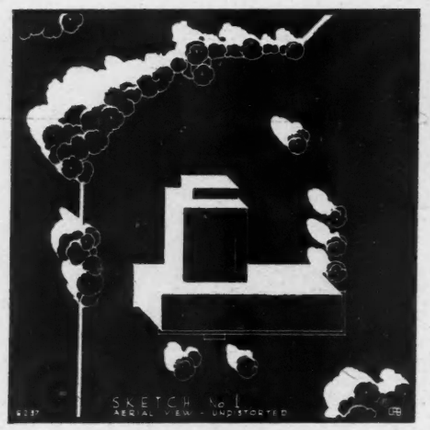
310. The word and the subject, after being in abeyance or in the keeping of the military for some years, are, necessarily, being revived. The word is generally taken to mean a curious but no doubt scientific application of paint in patches of various colours and shapes.

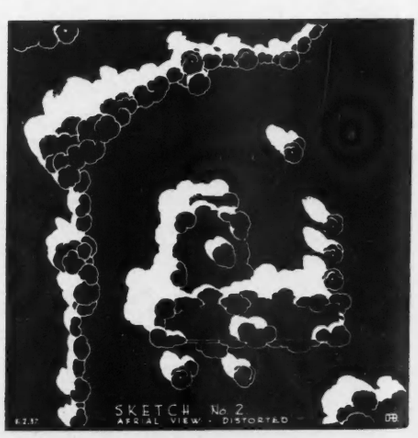
Paint is certainly one of the main ingredients in all camouflaging, and particularly in work on existing structures, but the subject is really much broader and wider in its scope.

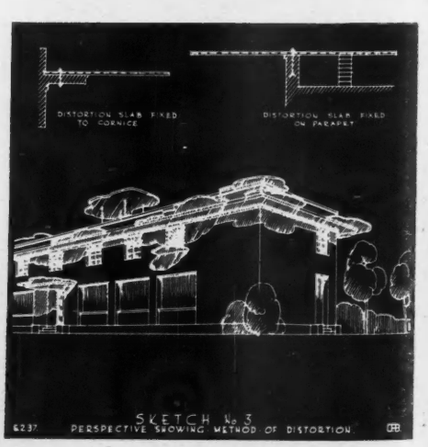
Camouflage should begin with the site. It should affect the location of buildings, the subdivision of buildings, and their grouping, their shape and height, and design.

The rigid geometry of most structural planning, the clean, sharp, straight-lined shapes it produces and the strong, clean shadows obtained are ideal from the aerial observers' point of view. But before yet another military factor is allowed to affect planning and design, a careful examination of the subject should be made to ensure that undue, unbalanced emphasis is not laid upon it.

It is clear that no amount of camouflage can ever render a building permanently "unlocatable" from the air. Careful and repeated observations and deductions will usually discover camouflage for what it is, and the aerial camera






DISTORTION SLAB FIXED TO CORNICE
DISTORTION SLAB FIXED ON PARAPET
SKETCH No 3
PERSPECTIVE SHOWING METHOD OF DISTORTION

Camouflaging a Building. (See para. 311.)

is extremely difficult to deceive. But camouflage can make a building extremely difficult to locate in a hurry or under other adverse conditions. The speed of the modern bomber and the weapons of defence both tend to make the location of specific objects difficult even when the objects are known and plotted. Camouflage can also make a

poor target; a sharp, clean target is obviously a better one than a muddled one that is difficult to separate from its surroundings.

There are, very broadly, three main departments in camouflaging buildings:—

(*a*) Siting and grouping of buildings.

(*b*) Faking or disguising shapes or parts of buildings with permanent, semi-permanent, or temporary structural work.

(*c*) Painting.

Little can be said on the subject of siting and grouping, because each case must be considered on its own merits, but again, very broadly, a number of small buildings are themselves less conspicuous than few large ones, and they are more readily disguised.

The faking or disguising of shapes may be a matter disguising some specific and recognisable structure to make it not only less conspicuous but also like something else—a deception. Such devices are necessarily temporary and likely to be changed at intervals. The more permanent work is in disguising hard geometrical shapes and definite shadow formations.

311. Three sketches illustrating one phase of this work are shown on p. xxx. by courtesy of Oliver P. Bernard, L.R.I.B.A. (*delt*), whose work in camouflage is well known. They show that much can be done to existing buildings to break up the geometrical shapes and hard shadows.

Such semi-permanent work would, of course, also need to be camouflaged with colour, but it cannot be too strongly emphasised that the design and application of painted camouflage is a matter for the specialist. Paint for camouflage work must be flat, not glossy; it must be weather-proof, and its light-reflecting value should change as little as possible with weather conditions (wet or dry).

Two particular aspects must be taken into account in designing painted camouflage. First, the appearance to the observer; and second, the photographic values. The requirements of the two will coincide at many points, but not wholly.

Apart from the question of the shape of each colour the main problem is in reducing the light-reflecting value of the paint to approximate to the surroundings. Generally most natural objects are not flat, but present a textured surface varying, of course, in scale from the proportion of leaf to shadow in a tree, to the proportion of tree to shadow in a group of trees. The light-reflecting value of such natural objects depends largely on the proportion of shadow. In the case of roofs, for instance, there is little or no shadow, and the light-reflecting value of the surface and colour used must be proportionately lower if it is to be even approximately the same in effect.

Only paints specifically designed for camouflage work should be used, and then only under the direction of a specialist camouflage designer.

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(2) J. B. S. Haldane. "A.R.P." Gollancz.

(3) Report of Swiss Commission on A.R.P. Berne, 1936.

(4) *The Builder*, January 6, 1939.

(5) T. E. Scott. Conference on Structural Air Raid Precautions, R.I.B.A., June, 1938; R.I.B.A. Journal, June 27, 1938.

(6) Instruction Pratique sur la Defense Passive, 1936.

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(14) A.R.P. Lessons from Barcelona. Major N. de P. MacRoberts. Eyre and Spottiswoode, 6d.

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(16) Paper read before the Institution of Heating and Ventilating Engineers, June, 1938, by A. C. Pallot, B.Sc. (Eng.), M.Inst.C.E., etc.

(17) The Design and Construction of External Strongholds. C. F. de Steiger. A paper read before the A.R.P. Institute. London, November, 1938.

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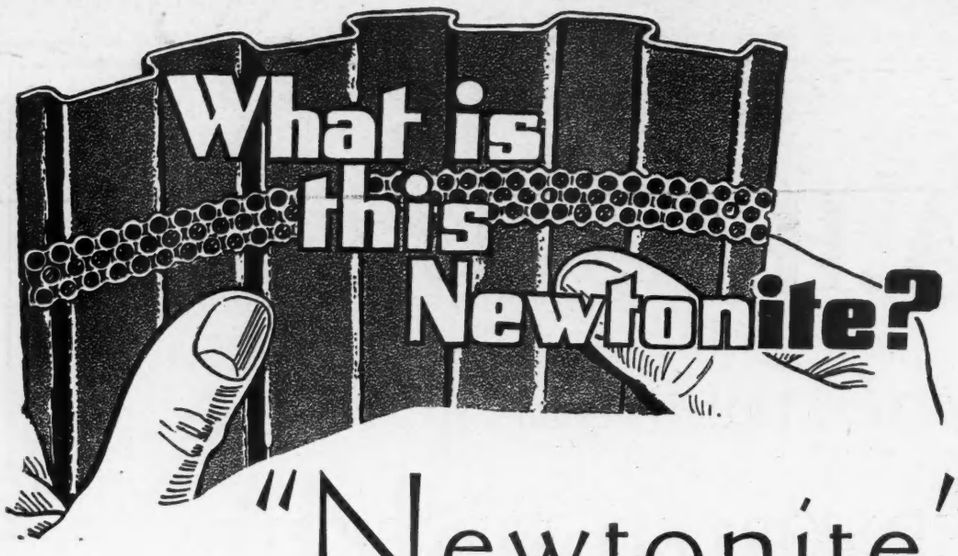

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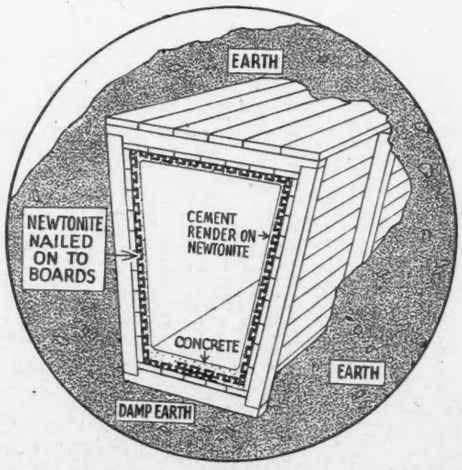

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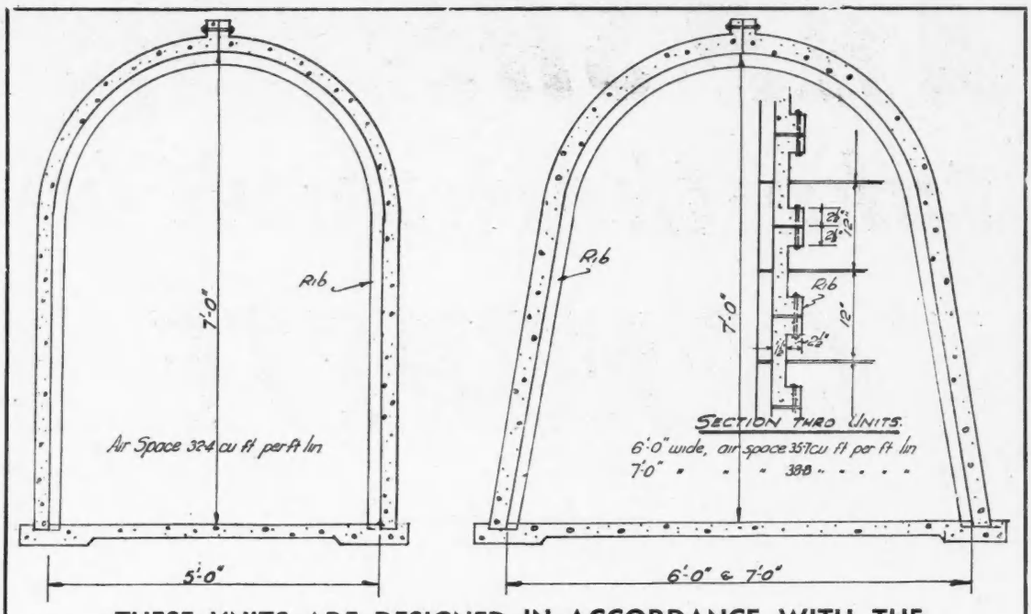

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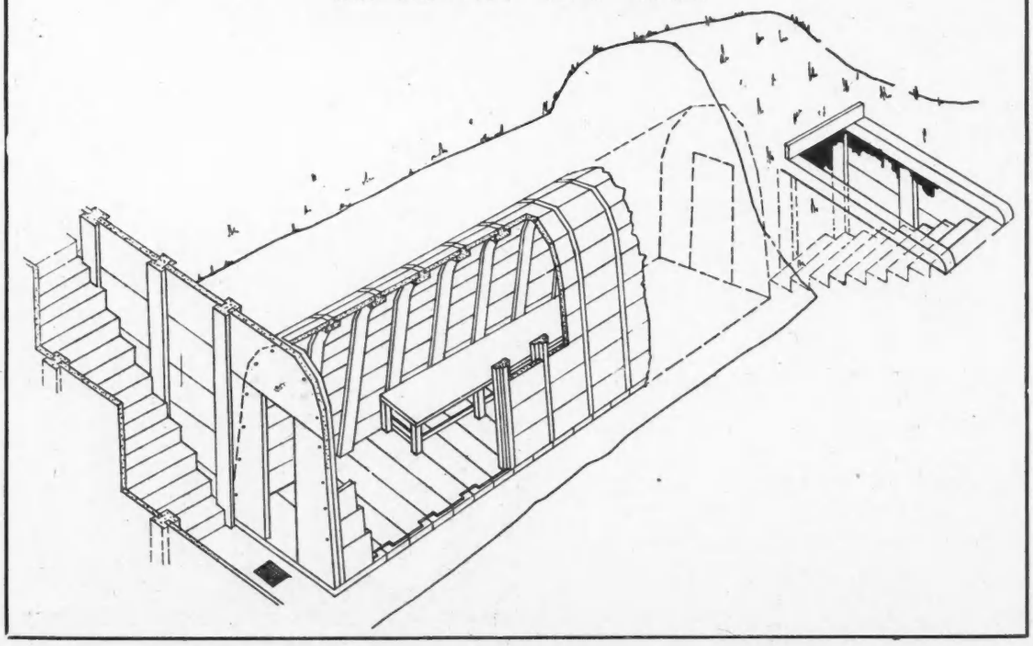

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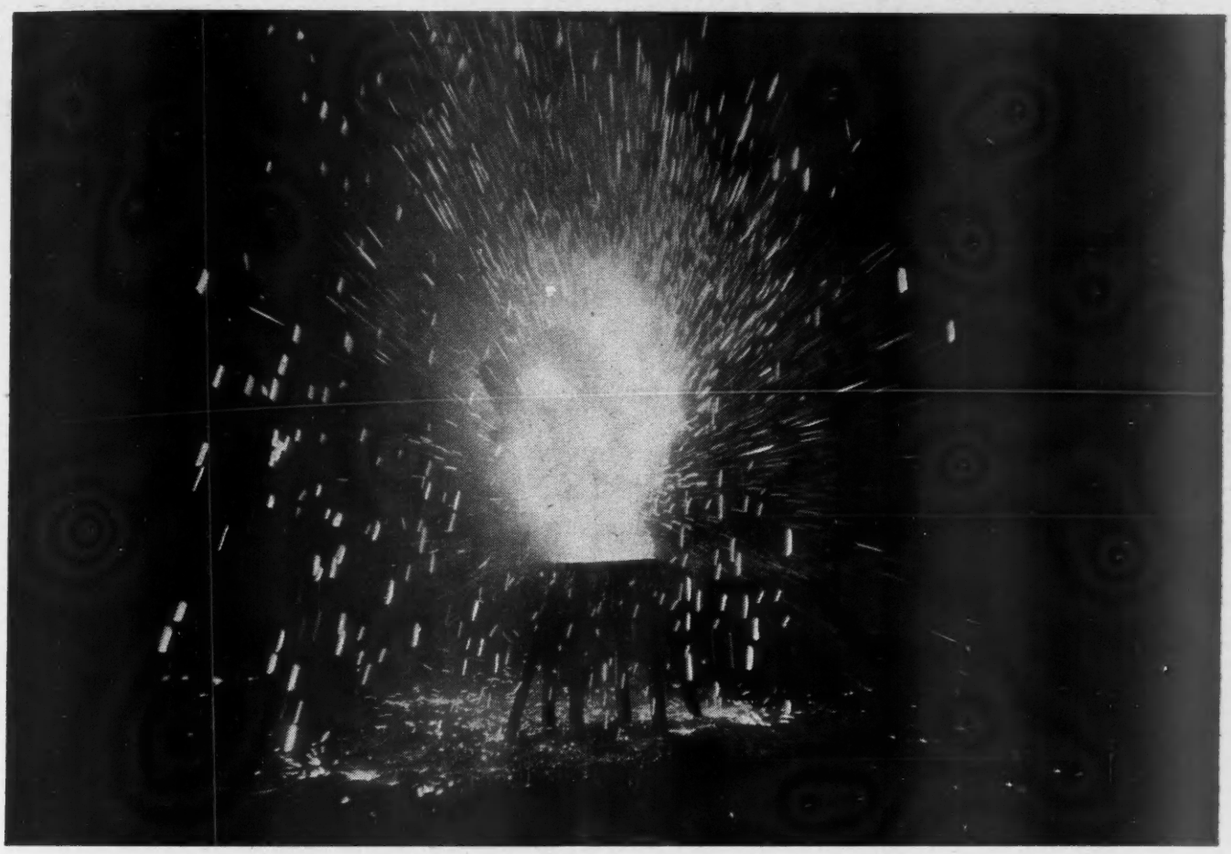

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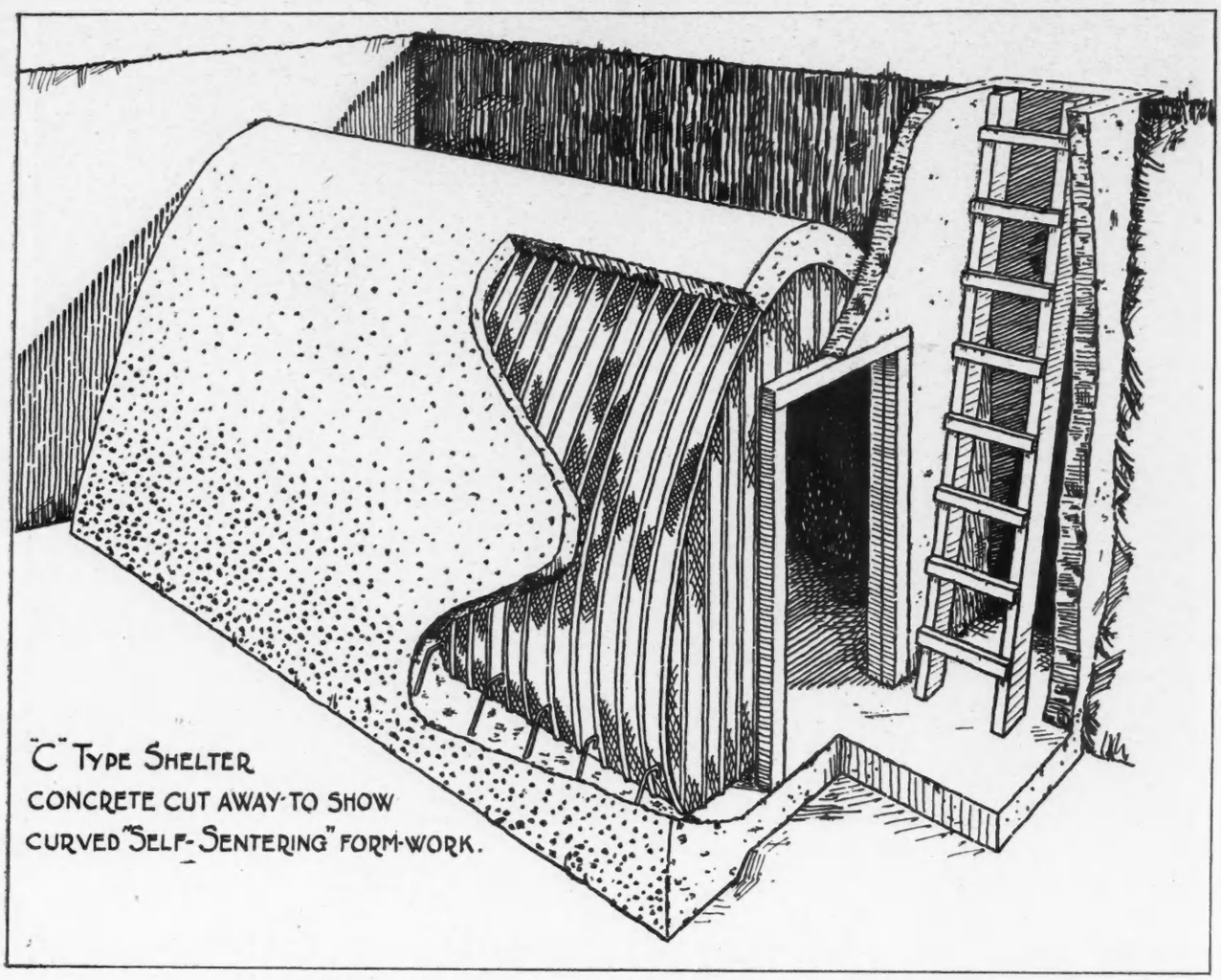

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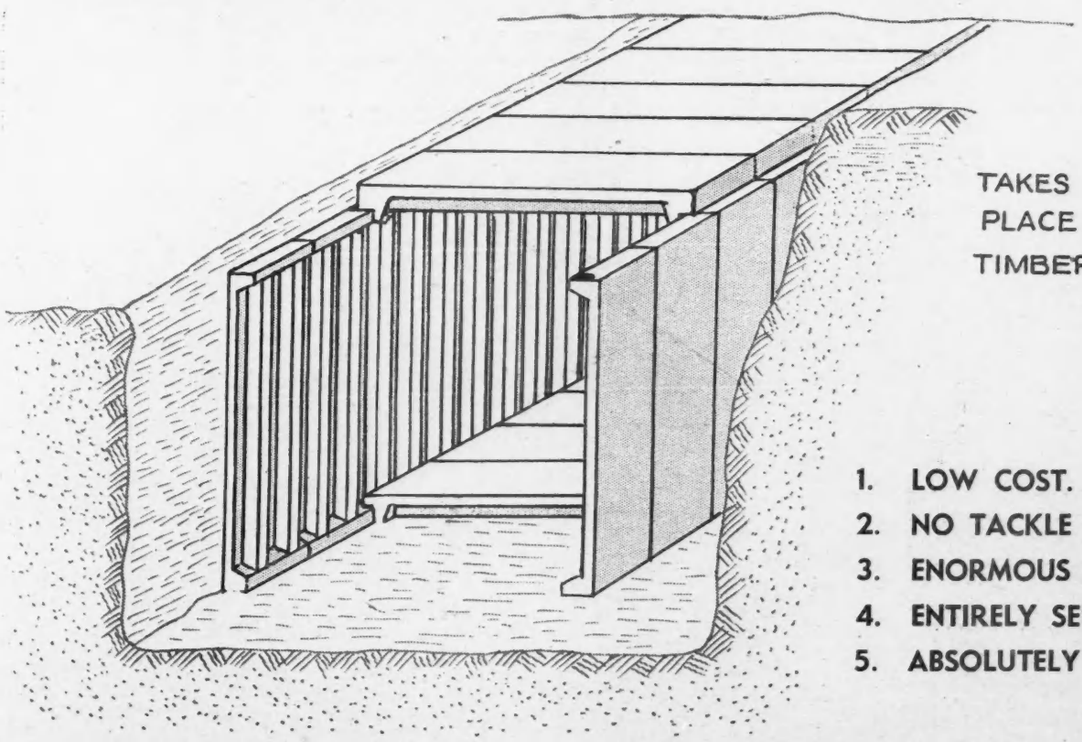

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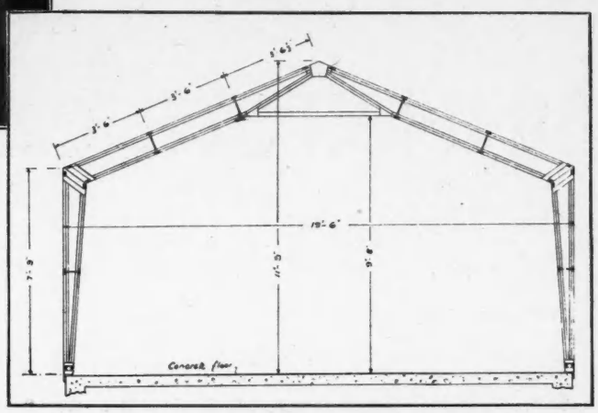

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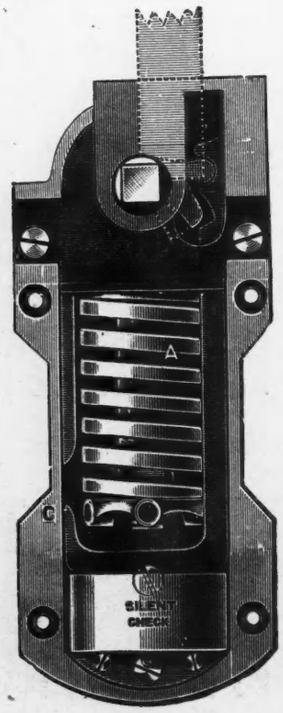

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Photo - - - The Oil Engine

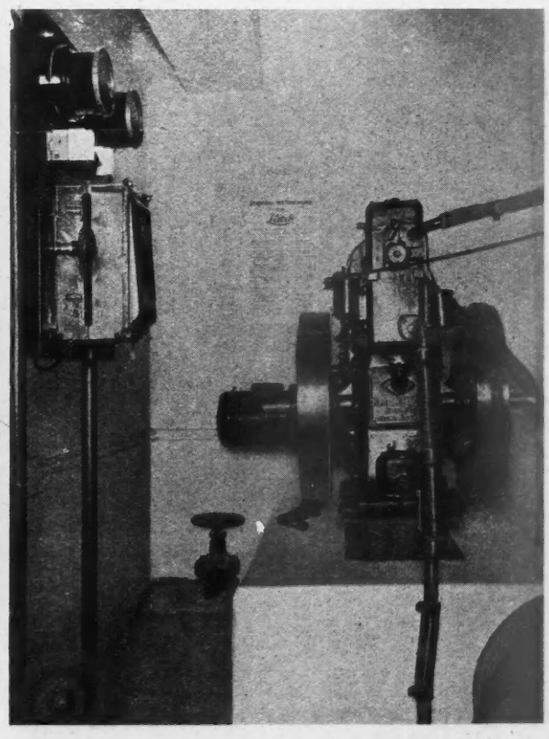

Photo - - - The Oil Engine

The engine room of a Lister installation in a block of modern flats as seen from the opening of the gas-proof door.

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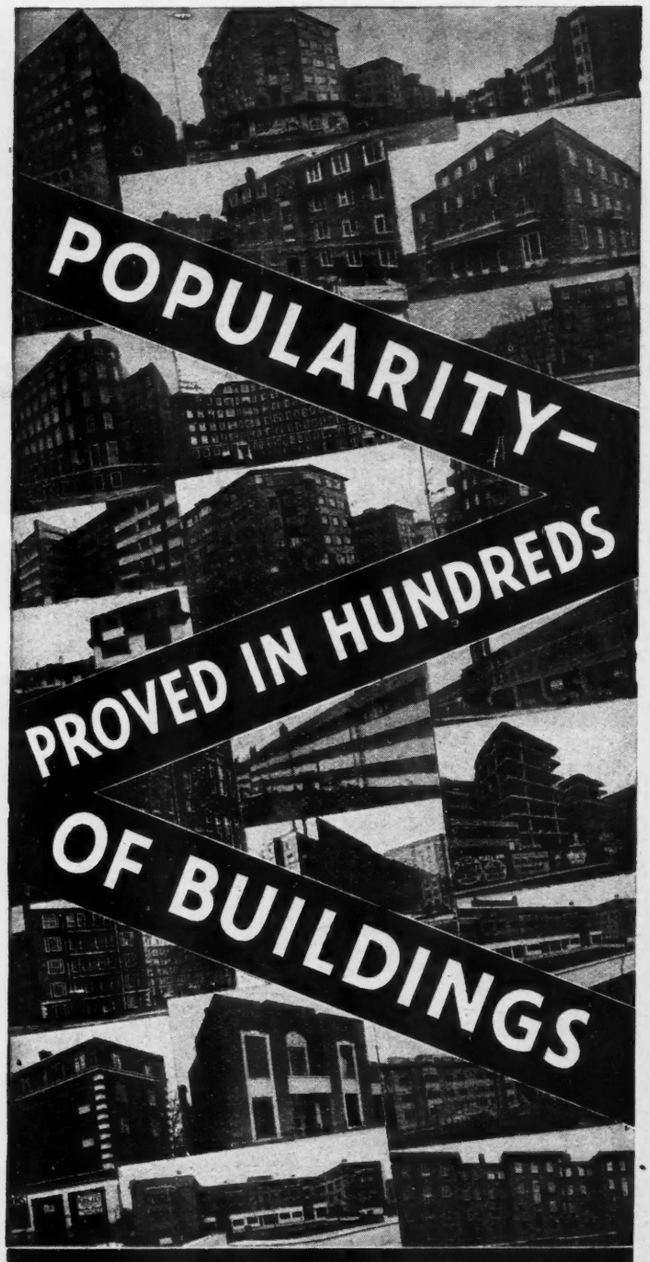

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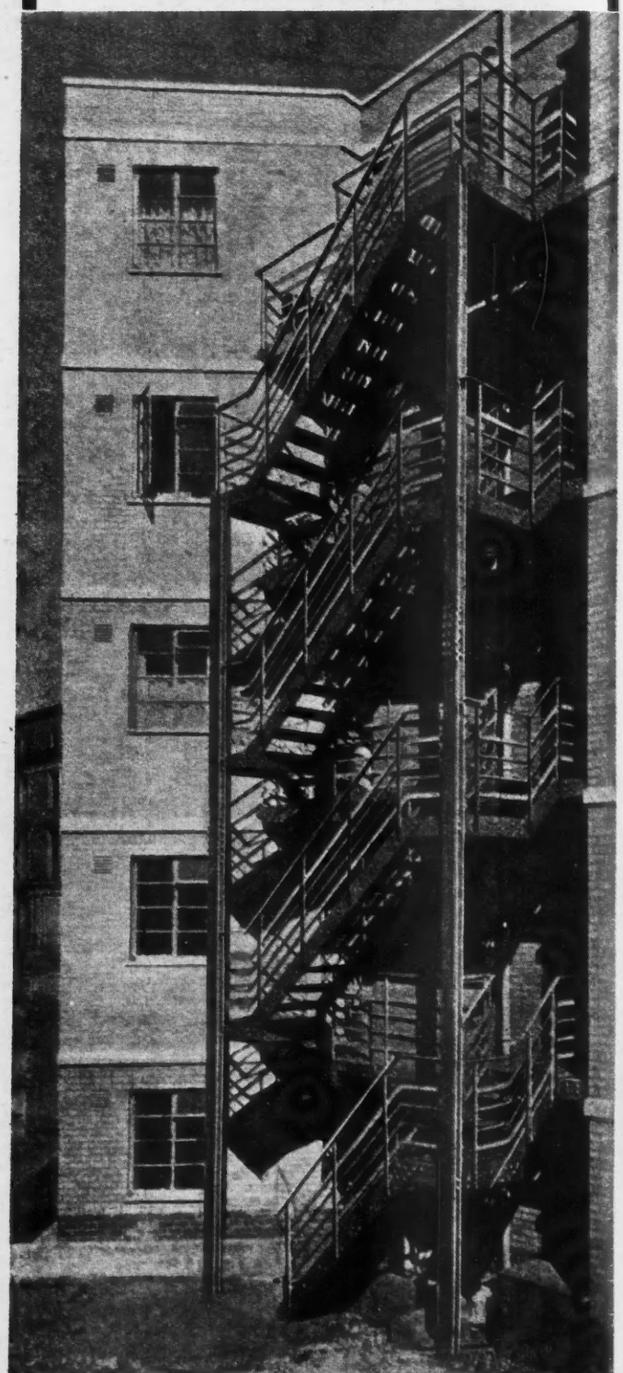

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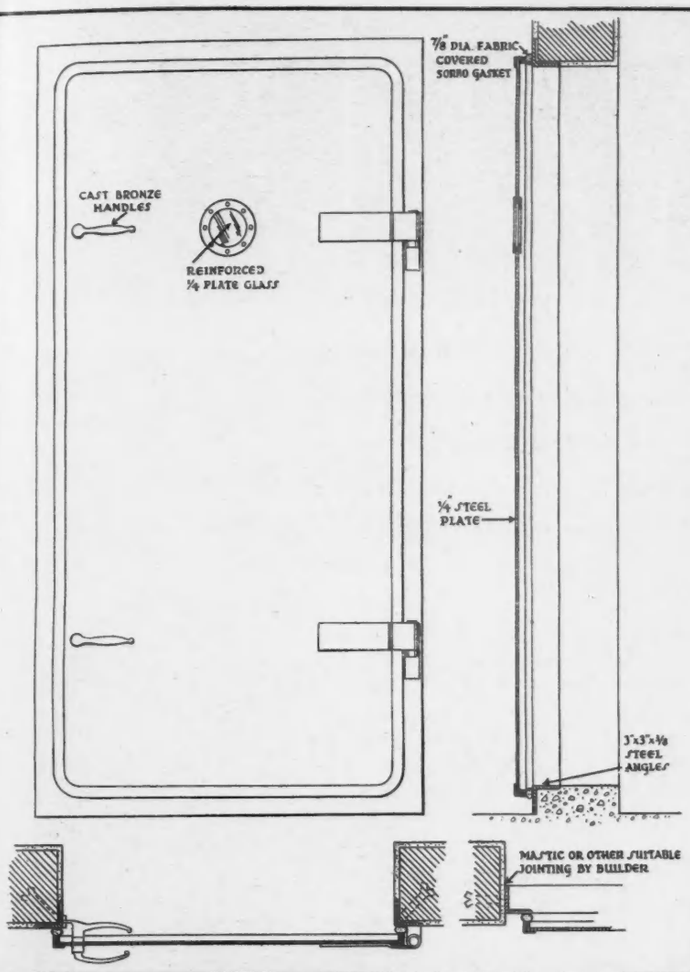
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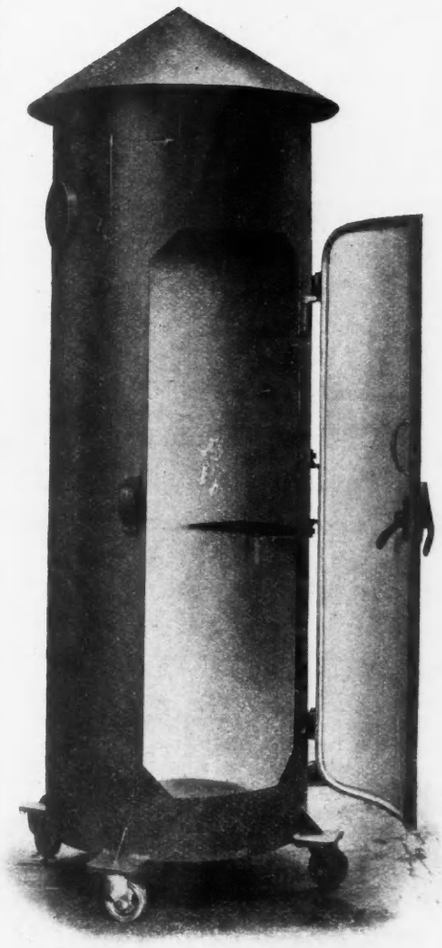
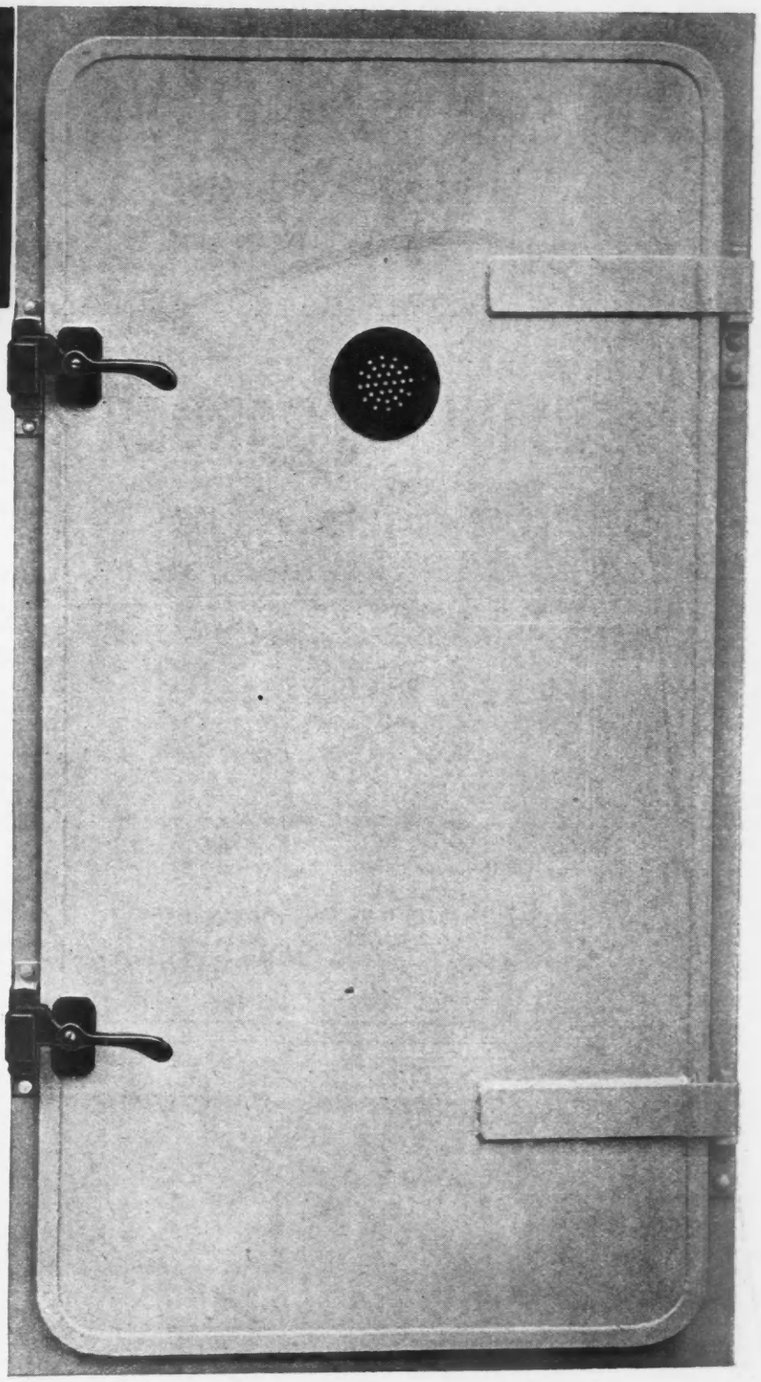


ALL-WELDED STEEL SHELTERS FOR KEY MEN



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Concrete Shelter constructed with two-cavity bonding concrete blocks 18" x 9" (reinforced and grouted if desired), with 7½" slab roof. External doors, interior equipment and partitioning of same general type as described above.

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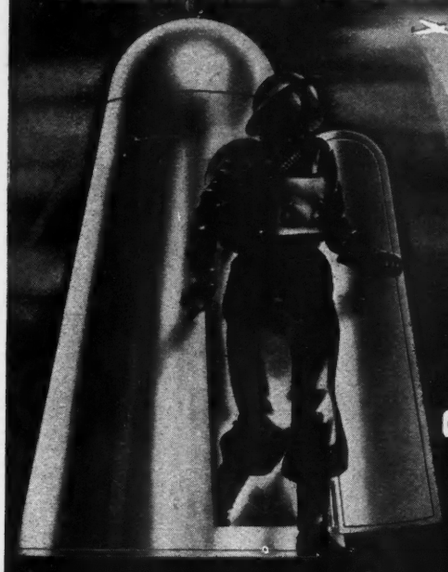

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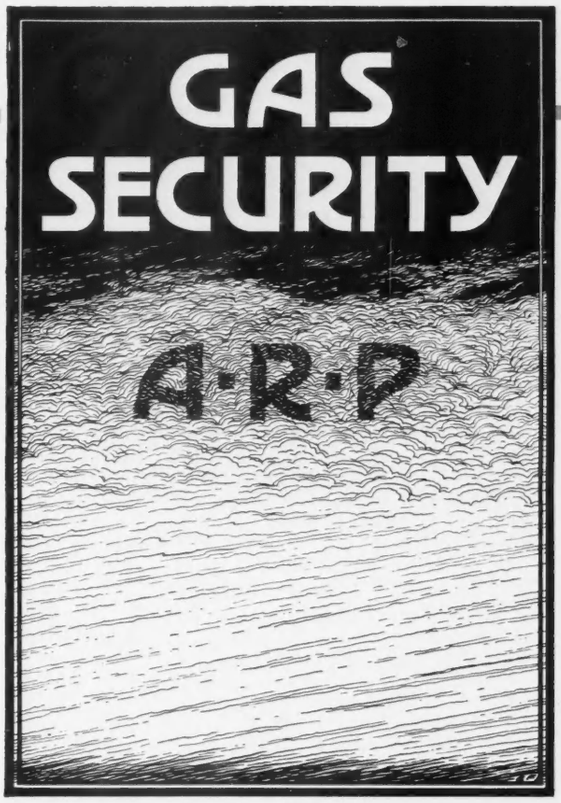
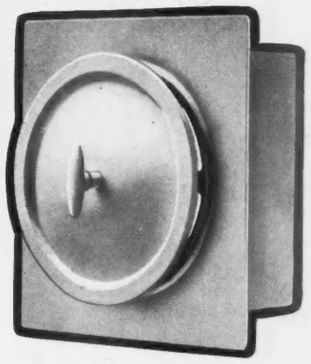
NUVAC "NOGAS" EXTRACTOR

The Nuvac Patent "Nogas" Natural Air Extractor is a ventilator which extracts vitiated air from a building or shelter irrespective of wind direction.

It is fitted with a gas-tight valve which positively seals the stack aperture when closed, but when open the valve in no way interferes with normal air extraction.





"NOGAS" WALL VENTILATOR

The "Nogas" Wall Ventilator, patent applied for, is designed to eliminate the necessity for sealing wall ventilators against gas with paper or other medium, an inconvenient process which renders ventilators inoperative for quite lengthy periods when required for general ventilation. Type W.G. 6" x 6" wall box size, is illustrated above.

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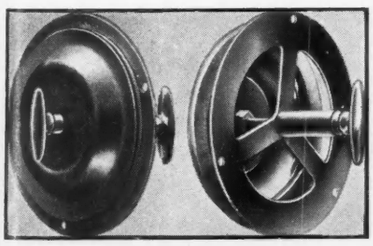
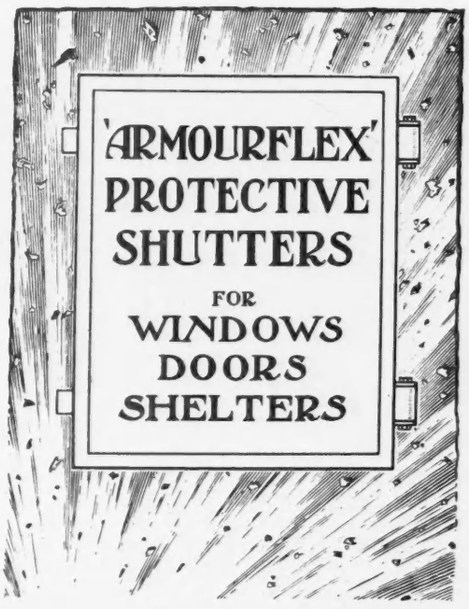
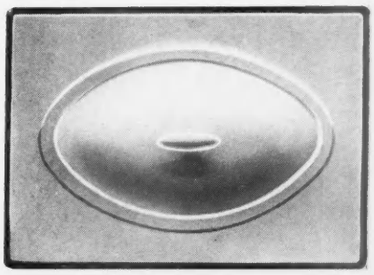


"NOGAS" DOOR VENTILATOR

Type DG Door Ventilator, patent applied for, illustrated by front and back views above, meets a long felt want and is especially suitable for inter-room ventilation and for keeping the atmosphere in cupboards, larders, stores, etc., sweet and fresh. Fitted with a gas-tight sprung valve, it can be closed instantly by a slight turn of a handle.





"NOGAS" WALL VENTILATOR

Illustrated above is Type WGO, size 9" x 6" wall box, consisting of an oval-shaped gas-tight sprung valve with handle control, and operated instantly in a manner similar to other types. It has a large free-air area when open and when closed is air-tight. Air entering is diffused. "Nogas" Ventilators are designed and manufactured at our own works.

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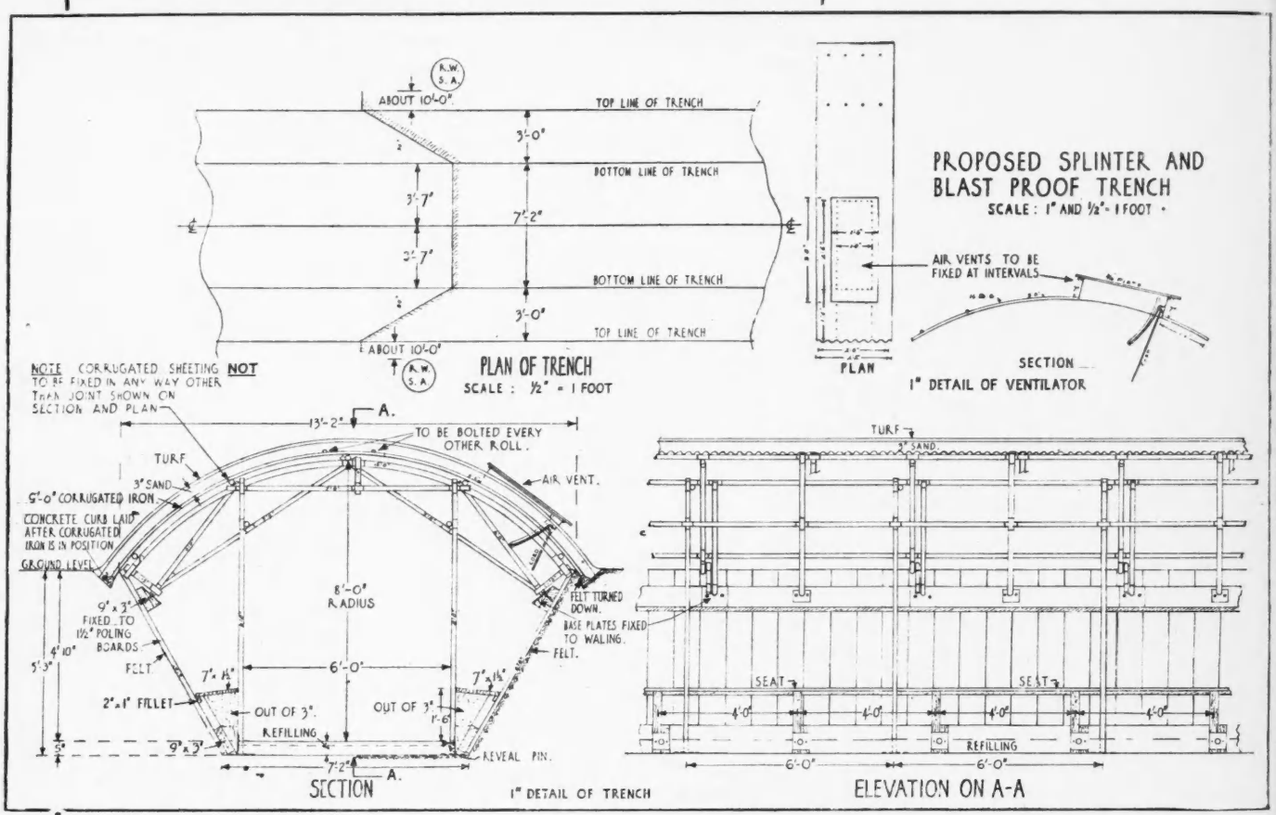
A.R.P. SHELTER

USE OF "BIG BEN" STEEL SCAFFOLDING



"BIG BEN" Steel Scaffolding as shown in the illustration above simplifies the construction of Splinter and Blast Proof Shelters for Air Raid Precautions. The design includes seating along each side, ample headroom and room for a stretcher to be carried through if necessary.

The sides of the trench are cut at an angle to avoid pressure and collapse whilst excavating, and waterproofed from side soakage by means of a layer of felt.

The roof is designed to be covered with a layer of sand which is then covered with turf acting as protection against incendiary bombs and splinters.

The under roof is abutted on a concrete curb which is laid after erection of under-roof.

Air vents are provided at requisite intervals.

Where necessary, and in accordance with mining procedure, the shelter could be curtained off in sections.

Shelters in this design can be erected and left in readiness provided proper drainage is included.

Entrance to the trench is provided by a battered ramp.

"BIG BEN" EQUIPMENT IS ALSO IDEAL FOR

Constructing Searchlight Towers, Racks for Gas Masks, Decontamination Clothing and sand bags, etc.

Strengthening of secondary construction in small buildings (floors and roofs).

Shoring of rooms for shelters in existing buildings (basements, cellars and rooms above ground).

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